Robert Pęczkowski

Messerschmitt Bf 109 E

MMPBOOKS

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Messerschmitt Bf 109 E

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Introduction

The Messerschmitt Bf 109 (also known as the Me 109) was the major single-seat fighter of the *Luftwaffe* throughout WW2, first entering service in the late 1930s. Produced in larger numbers than any other warplane, except the Soviet Ilyushin Il-2, it was an iconic design, loved by its pilots and feared by its enemies. Like its contemporary and adversary, the Supermarine Spitfire, the Bf 109 went through major design changes and developments, such that the final versions bore very little resemblance to the first ones and remained potent front-line fighters until the end of the war.

Starting with the Rolls-Royce Kestrel, powered first prototype, Jumo-powered early production versions labelled A, B, C and D, were built, all very similar. The advent of the Bf 109E marked the start of the design's progress to fully operational and world-leading fighter, and it was this version which saw action from Poland through to the Battle of Britain.

The E version ('Emil') of the Bf 109 was the one with major changes. Until that time, all changes had been rather minor, mostly cosmetic. Changing the engine from the Jumo 210 to the most modern Daimler Benz DB 601A required many other changes, so the Emil become almost a new aircraft. One main advantage of the new engine was that it was fuel injected, a first in any service fighter.

Because of the new engine there were many changes, such as a longer fuselage (by about 40 cm compared to the Jumo 109 versions) with a more robust structure, plus a new cooling system for the engine and oil. In addition, there was a new propeller, new armament and many other systems.

Messerschmitt Bf 109E-1 preparing for the take off.

Prototypes

Daimler-Benz engineers started to develop a modern aircraft engine in the 1930s. The designers focused their attention on creating a compact engine with high power output. The DB 600 series eventually emerged as a liquid-cooled, inverted-Vee, 12-cylinder piston engine of 30 litres (1,800 cu in). This was designated F4, and by 1931 two prototypes were running on the test bench. These were followed by the improved F4B, which became the prototype for the DB 600. In 1933, Daimler-Benz finally received a contract to develop its new engine and to build six DB 600s.

The DB 601A-1 was a development of the DB 600 with mechanical direct fuel injection. Like all DB 601s, it had a 33.9 litre displacement. The first DB 601A-1 prototype, designated as F4E, was test run in 1935.

The engine was a state-of-the-art design. It featured not only the mechanical direct fuel injection, but also automatic boost air pressure control and could accommodate an internal weapon between its cylinder blocks.

The DB 601 could deliver 1,175 hp, almost 40 percent more than the Junkers units used on the earlier Messerschmitt 109 models.

The new Daimler engine was tested on the Bf 109 in the summer of 1937. Three Bf 109B airframes were modified. Prototypes designated V14 and V15 were equipped with the DB 600 and, later, DB 601 engines. At the same time, another Bf 109B airframe was modified and designated V13.

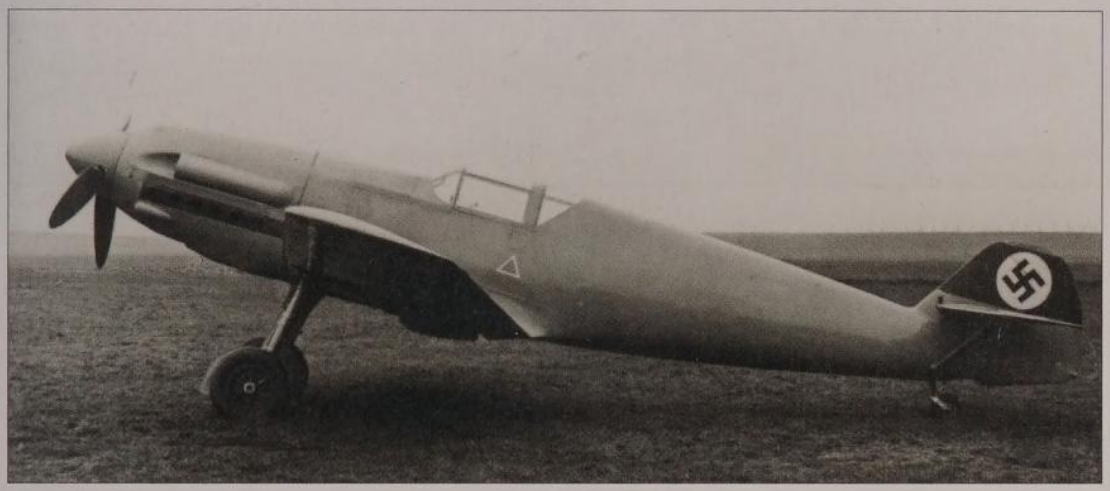
That aircraft was specifically prepared to take on the prestigious world air speed record for a conventional landing gear aircraft. It was equipped with a modified, high performance DB 601/III engine (also called Daimler-Benz DB 601 Re III), which could deliver 1,600 hp instead of the standard 1,100 hp.

All prototypes were demonstrated at a Zurich Air Meet in July 1937. After the return from Switzerland the V13 prototype was fine-tuned and took off for a record-breaking flight on 11 November 1937 with Dr Hermann Würster at the controls. The new record now stood at 610.21 km/h (381 mph).

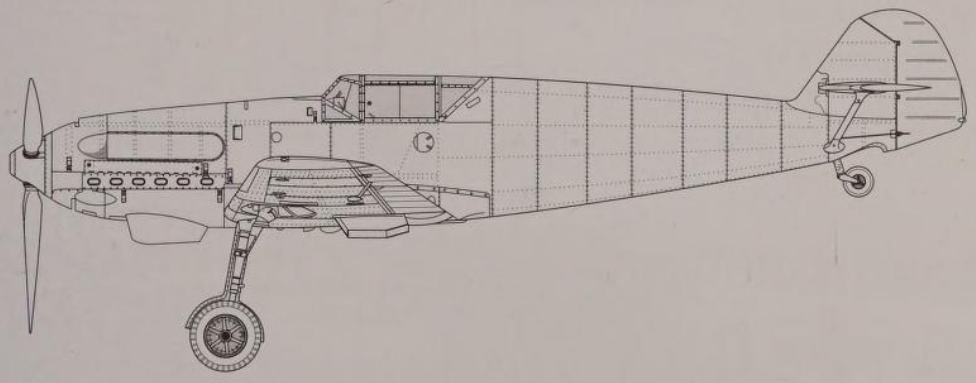
Bf 109 prototypes with DB 601A engine

Bf 109 V13 – built for participation in the VI International Air Meeting in Zurich and for world air speed record flight. The aircraft had standard B version airframe, without armament and with the Spezial-DB 601 A (DB 601 1/III) engine. The first flight was on 14 June 1937. Later, the engine was returned to the Daimler-Benz factory and the aircraft was again tested in July.

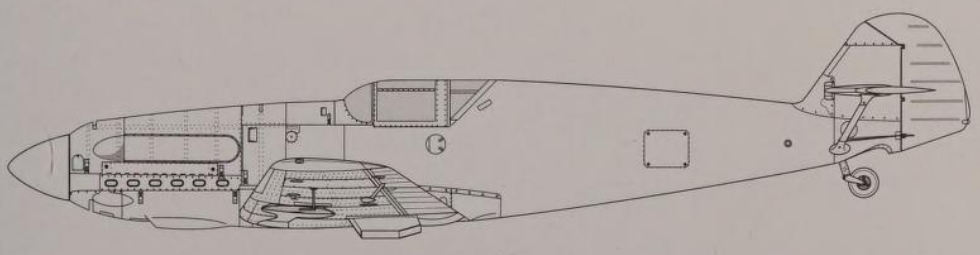
After the Zurich Air Meeting aircraft was converted to speed record configuration:
New canopy.
The fuselage and wings were puttied and polished to a high gloss.
Call sign: D-IPKY, W.Nr. 1050



Bf 109 V13, D-IPKY, photographed during the VI International Air Meeting in Zurich, end of July 1937. Bf 109 V13 in speed record configuration. Note different canopy and more streamlined spinner. The fuselage and wings were puttied and polished to reduce drag.



Bf 109 V13 as parti cipated in the Zurich Air Meeting. 1/72 scale.

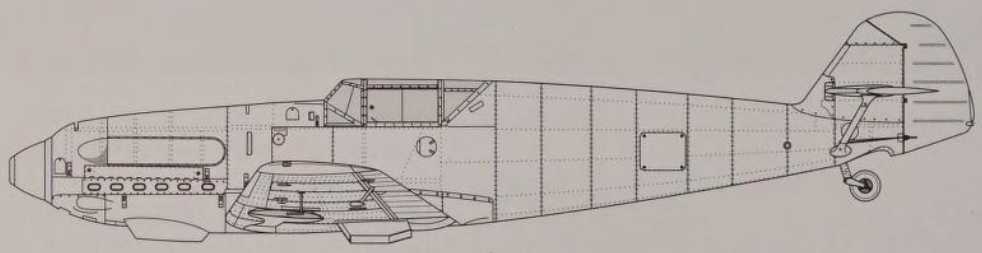


Bf 109 V13 in speed record configuration. 1/72 scale.

Bf 109 V14, D-ISLU during the VI International Air Meeting in Zurich, end of July 1937.

Bf 109 V14 – also built for participation in the VI International Air Meeting in Zurich.
Aircraft had standard B version airframe, without armament and with DB 601 Rennmotor II racing engine (1,564 hp).
Call sign: D-ISLU, W.Nr. 1029.

Bf 109 V14. 1/72 scale



Bf 109 E prototypes

Bf 109 V15 (D-IPHR) (from January 1940 CE+BF)
W.Nr. 1773

The first flight was made on 18 December 1937 with a DB 601A engine (W.Nr. 148).

The new engine meant that other changes were required, i.e. a 40 cm longer fuselage compared to the Jumo powered 109 versions, and a new cooling system for the engine and oil. There was also a new propeller (three-bladed Vereinigte Deutsche Metallwerke (VDM)), and stronger fuselage structure. New armament was also installed as were many other systems.

The water and oil cooling systems were also completely redesigned. The water cooling system was divided into two parts – one radiator was located under each wing, close to the wing root. The oil cooler was located beneath the forward fuselage.

The welded steel tube engine mount of the earlier Bf 109 versions was replaced by two engine bearers made of pressed Elektron.

A supercharged air intake had to be fitted to the engine cowling in order to provide air to the supercharger. The air intake used on V13 and V4 was retained for some time (some E-0 aircraft). Later, tests resulted in a better air intake shape.

Armament consisted of two MG 17s in the upper fuselage and two MG 17s with electrical-pneumatic firing system in the wings.

Bf 109 V15a

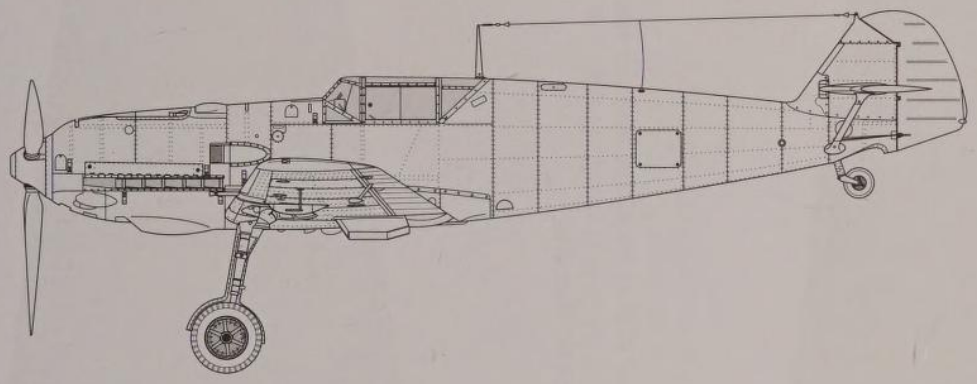
Call sign: D-ITPD

W.Nr. 1774

The first flight was taken on 21 April 1938 by Dr. Würster. Aircraft was constructed to the same standard as the V15.

Tests of the two prototypes, V15 and V15a, revealed various shortcomings, which had to be eliminated before the start of production.

The main problem was the DB 601 engine, also the water and oil cooling systems were not perfect, so a new, larger oil cooler was developed and installed on the E-0 version.

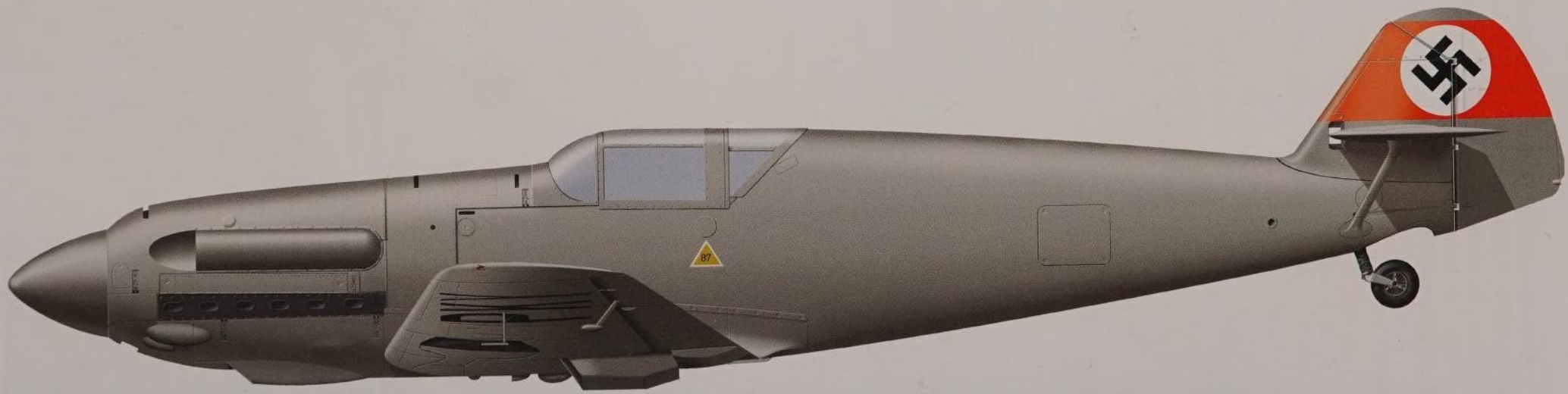


Bf 109 V15. 1/72 scale.

Bf 109 V15, now as CE+BF after turn-over during landing.

Above: Bf 109 V13, D-IPKY as was seen during the VI International Air Meeting in Zurich. Aircraft RLM 63 overall with black code letters.

Below: Bf 109 V13 in speed record configuration. The fuselage and wings were puttied and polished to reduce drag.



Above: *Bf 109 V14, D-ISLU, '6' as was seen during VI International Air Meeting in Zurich. Aircraft Red RLM 23 overall with white code letters.*

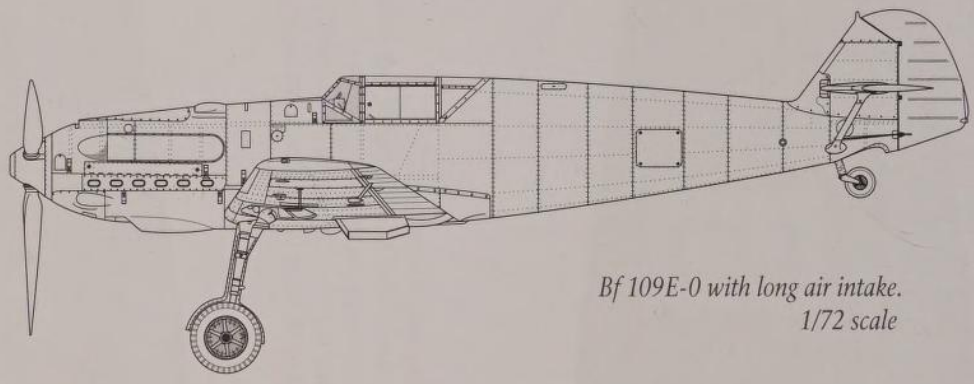
Below: *Bf 109E-0, W.Nr. 1784, 'White 18'. Aircraft in camouflage and markings, photographed to pretend the new Bf 109D in service. RLM 70* Schwarzgrün *(Black Green) and RLM 71* Dunkelgrün *(Dark Green) splinter camouflage uppersurfaces and RLM 65* Hellblau (Light Blue) *undersurfaces.*

Versions

Bf 109 E-0

Ten examples of the pre-production Emils were built in the Augsburg factory, where acceptance flights were also carried out in the second half of 1938. Supercharger air intakes of different types were tested (long and short ones). There are known photos of the E-0 only with the long air intake.

The aircraft was powered by a DB 601 A engine, and armament consisted of four MG 17s, two in the front fuselage and two in the wings.



Bf 109E-0 with long air intake. 1/72 scale

Bf 109E-0, W.Nr. 1784 in camouflage pretending to be a new Bf 109D. Disinformation, propaganda photos. Winter 1938.

Bf 109E-1 & E-3

Bf 109E-1 as the first truly combat-ready Emil was put into production in December 1938. This version was powered by a DB 601A engine. Altogether the E-1 was armed with four MG 17 guns, two in the front fuselage and two in the wings.

Simultaneously with the E-1 the E-3 version was also built. The only difference between the E-1 and E-3 was the wing armament. E-3 was equipped with two MG FF cannons.

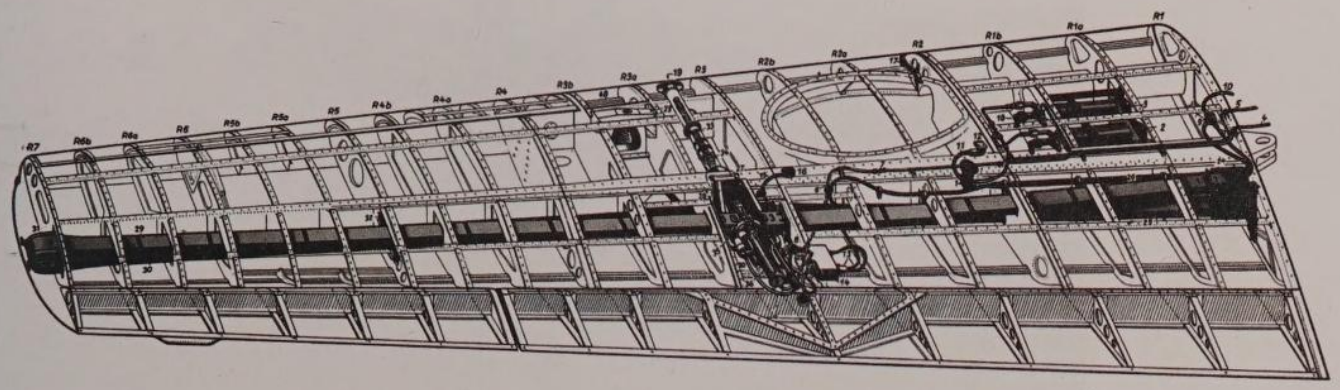
There were two versions of the MG FF cannons, the 'A' and 'B'. Version 'A' had an electrical-pneumatic firing system (EPA-FF), whilst the 'B' version was fired electrically (EA-FF). Both variants were equipped with an electrical-pneumatic cocking system (EPD-FF).

Modifications during production

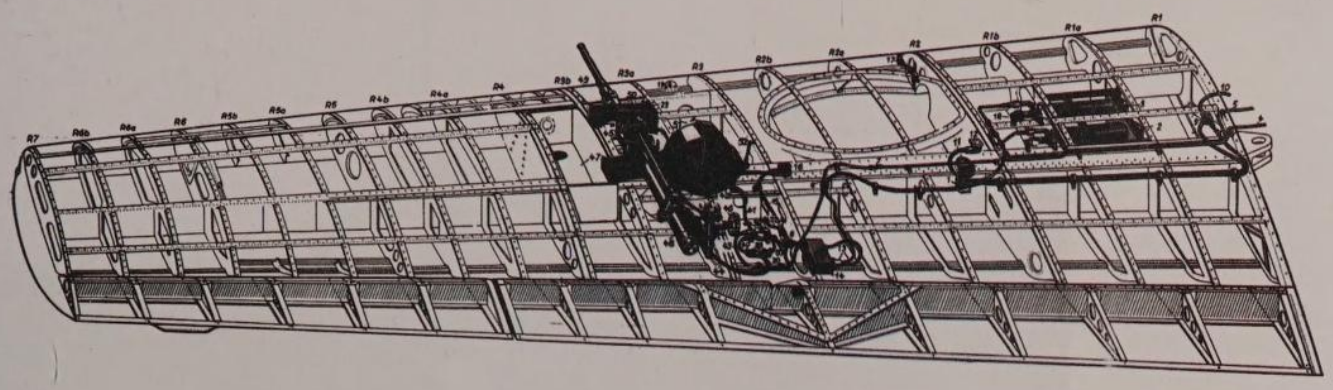
On the production line, many modifications were made without any designation change. Very early in production the horizontal fin in oil cooler air intake was deleted.

The introduction in June 1939 of a complete power unit, i.e. engine plus all equipment, installation and engine mount, was a significant change. Such a unit was called *Triebwerk* and this improvement provided no changes in the look of the aircraft, but made production of the plane easier. Also, exchanging an engine in the field was much easier.

The next change was the introduction of the armoured headrest, which also acted as roll-over protection. A little later, a new armoured canopy was introduced (see E-4).



Bf 109E-1 wing construction showing armament arrangement. (Technical Manual)

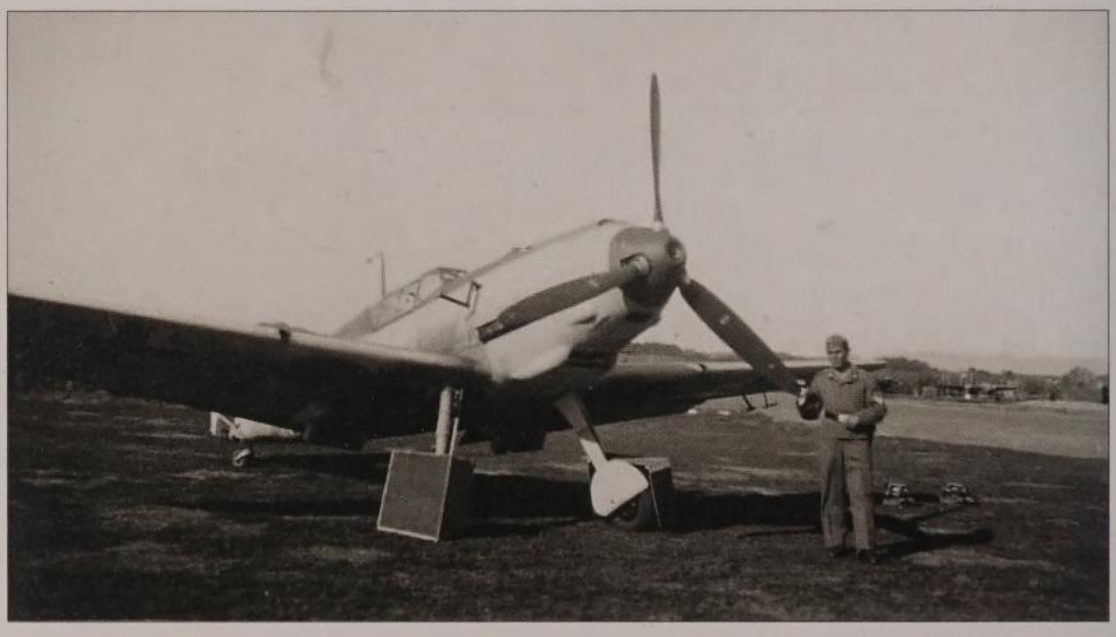


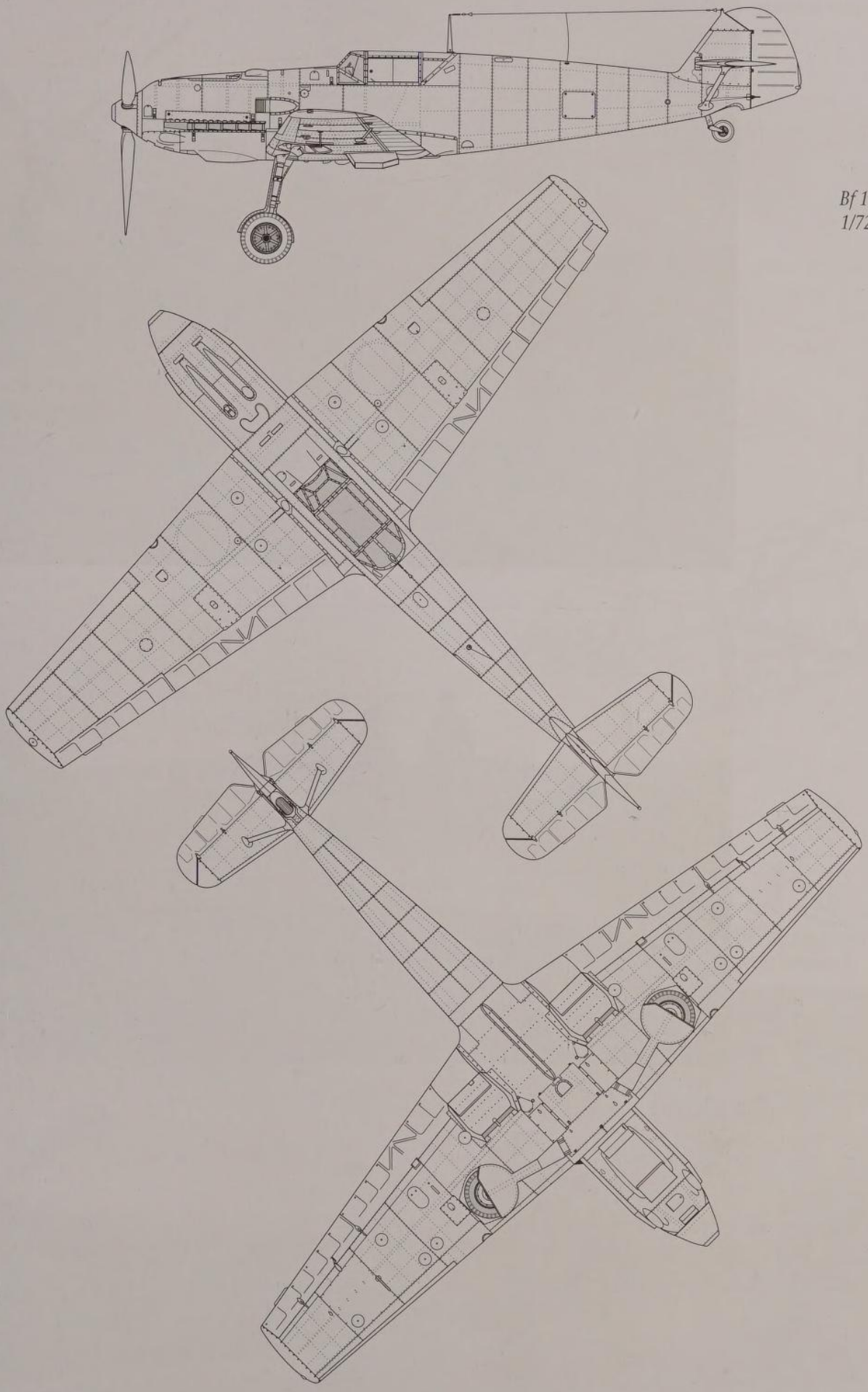
Bf 109E-3 wing construction showing armament arrangement. (Technical Manual)

Bf 109E-1, 6-121, of 2.J/88 Legion Condor, Spain, 1939. This aircraft was usually flown by Oblt. *Karl-Wolfgang Redlich. (via José Fernandez)*

Bf 109E-1 of I./JG 27, ready for combat mission. France 1940. Aircraft still in the older camouflage.

Bf 109E-1 of unknown unit. Aircraft in the camouflage introduced in 1940.





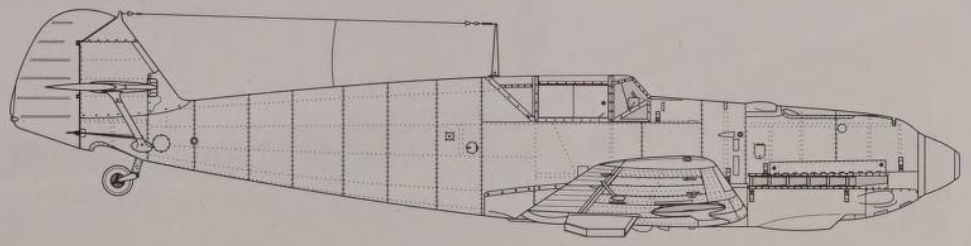
Bf 109E-1.
1/72 scale.

Front, starboard view of the Bf 109E-1. Note old, big style underwing cross.

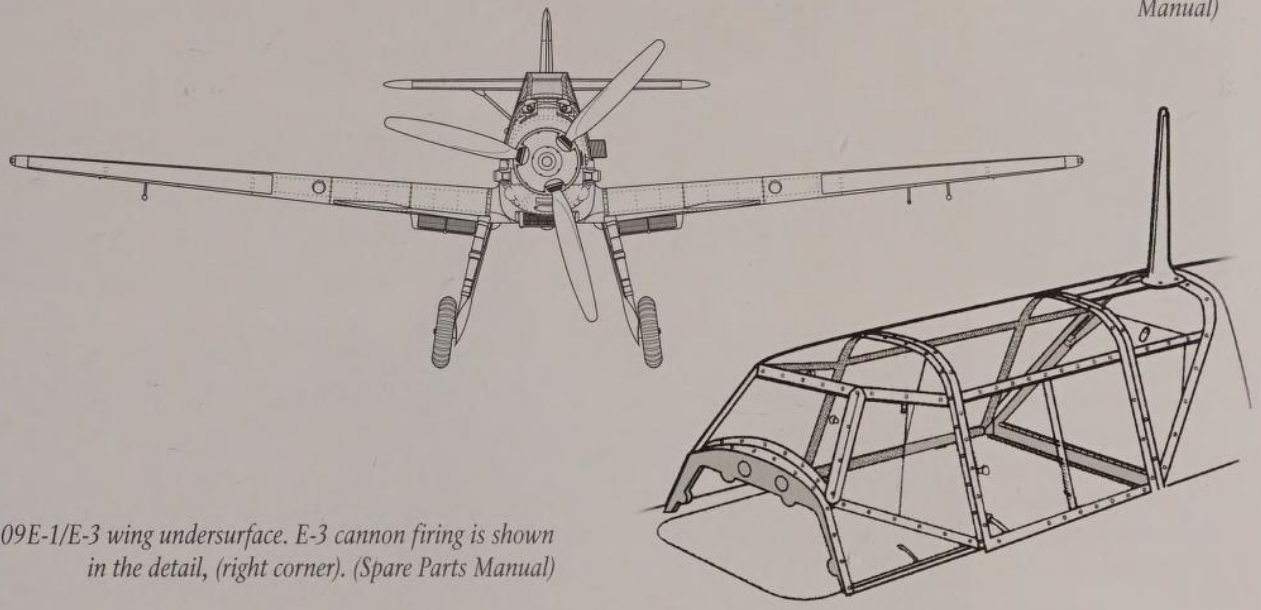
Bf 109E-1 of 2./JG 3 crash landed in France, 1940.

Bf 109E-1 of I./JG 20, September 1939.

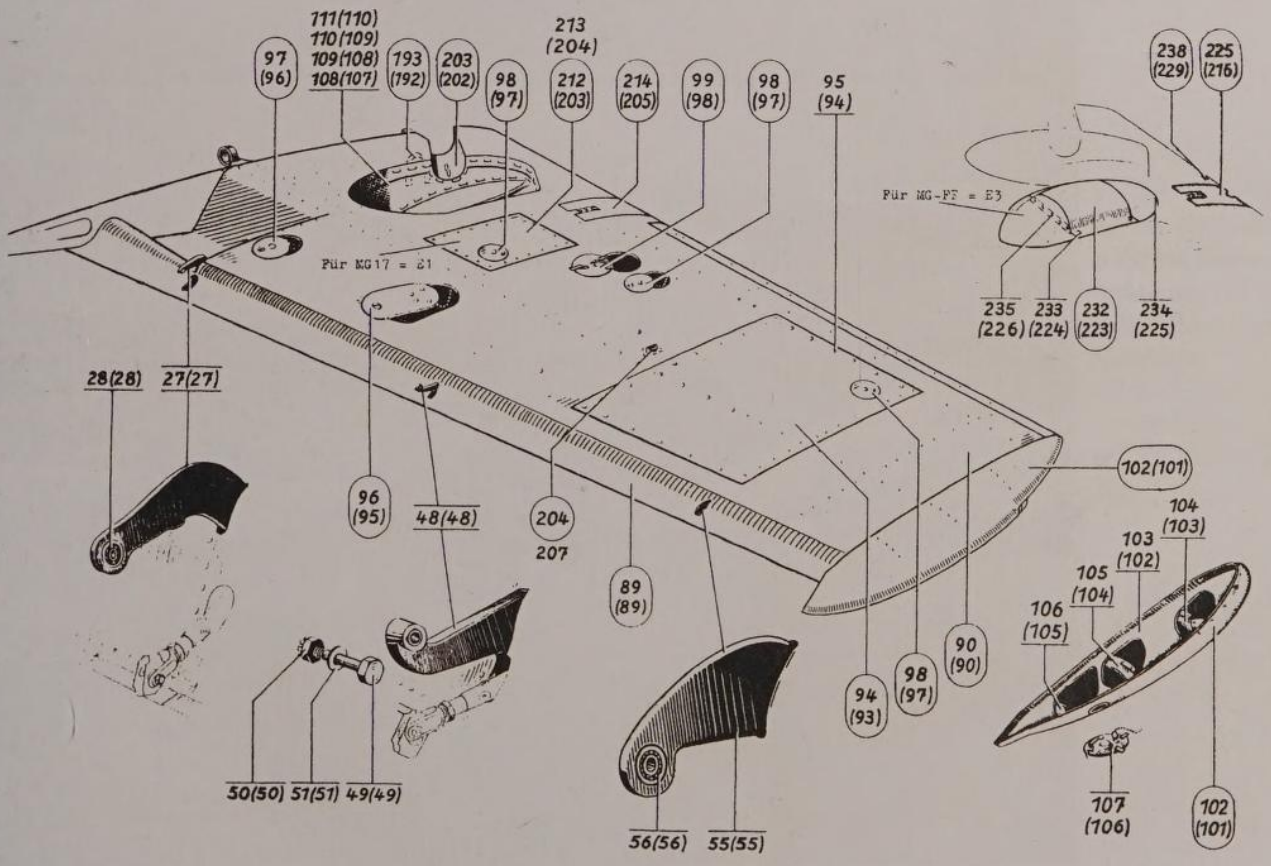
Bf 109E-1.
1/72 scale.



Below: Bf 109E-1/E-3 canopy. (Technical Manual)

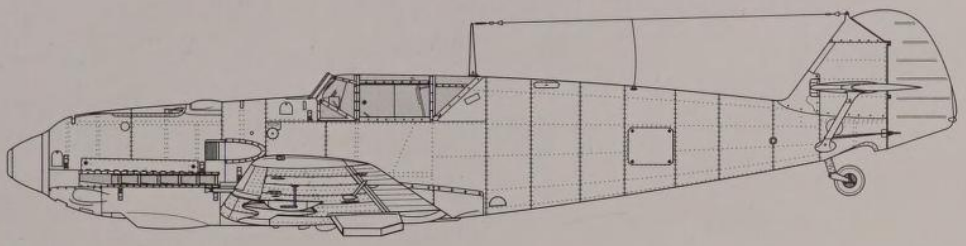


***Below**: Bf 109E-1/E-3 wing undersurface. E-3 cannon firing is shown in the detail, (right corner). (Spare Parts Manual)*



Two photos of Bf 109E-3, 6-111, of 2.J/88, Legion Condor, flown by Lt. W. Ursinus. *Spain, early 1939. Aircraft with name 'Bärchen' (Teddy Bear) (via. José Fernandez)*

Bf 109E-3 of 3./JG 76, October 1939. Aircraft was probably painted in RLM 70 uppersurfaces overall, with RLM 65 underneath



Bf 109E-3 with additional windscreen armour mounted on the early style canopy. 1/72 scale.

Two photos of Bf 109E-3, canopy with additional windscreen armour.

Bf 109E-3, W.Nr. 5102, of I./JG 77, May 1940, Orendorf, during invasion of France. Personal aircraft of Gruppen Adjutant. *Note details of the rear part of the canopy.*

Another Bf 109E-3, (probably 'Black 6') of I./JG 77, Olendorf, May 1940.

Above: Bf 109E-3, W.Nr. 1304, 'White 1' of I./JG 76. Aircraft was captured by French troops at Woerth, Bas-Rhin, on 22 November 1939.

Below: Bf 109E-3 of JG 53. Note starter crank in position. (Dénes Bernád coll.)

Bf 109E-3 photographed during the winter 1939/40.

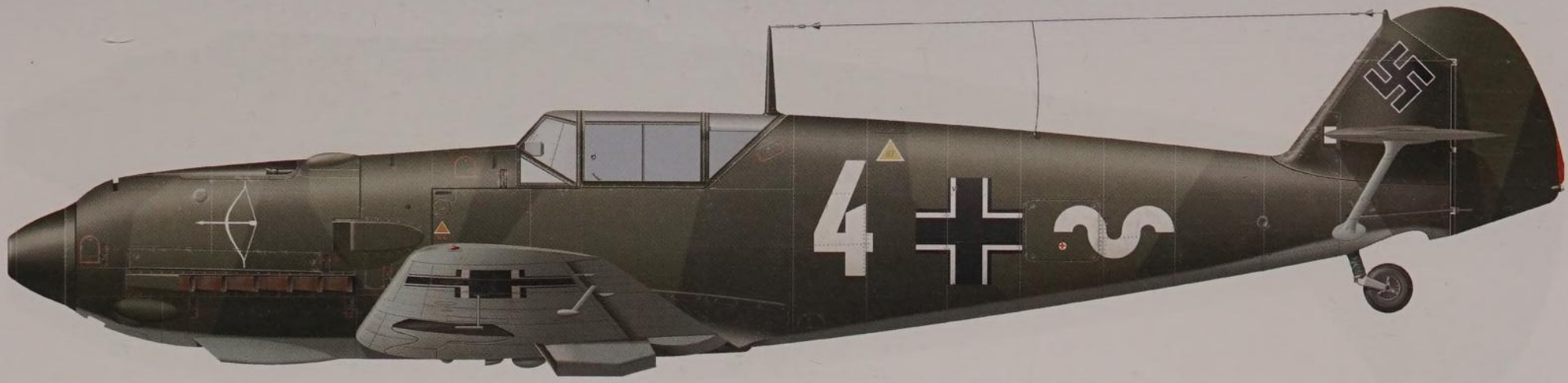
Bf 109E-3, 'White 1' of 4./JG 53. March 1940. Personal aircraft of Staffelkapitan *(commander) of the unit,* Hptm. *H. Kroeck. Note rear view mirror mounted on the windscreen.*

Below: Bf 109E-3, 'Red 4', unit unknown.

Two Bf 109E-3s of an unknown unit parked on the airfield.

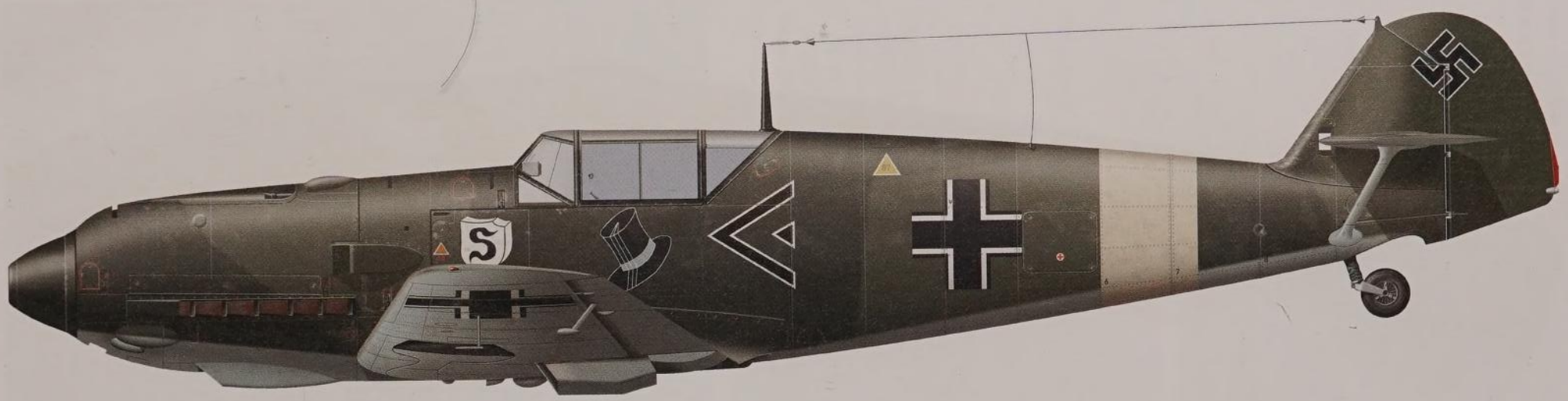
Port side of Bf 109E-3 of JG 76.

Wartime colour photo of Bf 109E-3 (or E-4 with earlier canopy), 'White 13'. Aircraft of III./JG 26, Calais, France 1940. Personal aircraft of Leutnant *Walter Blume.*



Above: Bf 109E-1, 'White 4' of 1./JG 20, Brandenburg-Briest, September 1939. Aircraft in splinter camouflage RLM 70 and RLM 71 on the uppersurfaces and RLM 65 undersurfaces.

Below: Bf 109E-1, 'Red 15' of 2./JG 77. Germany 1939. Aircraft in splinter camouflage RLM 70 and RLM 71 on the uppersurfaces and RLM 65 undersurfaces.

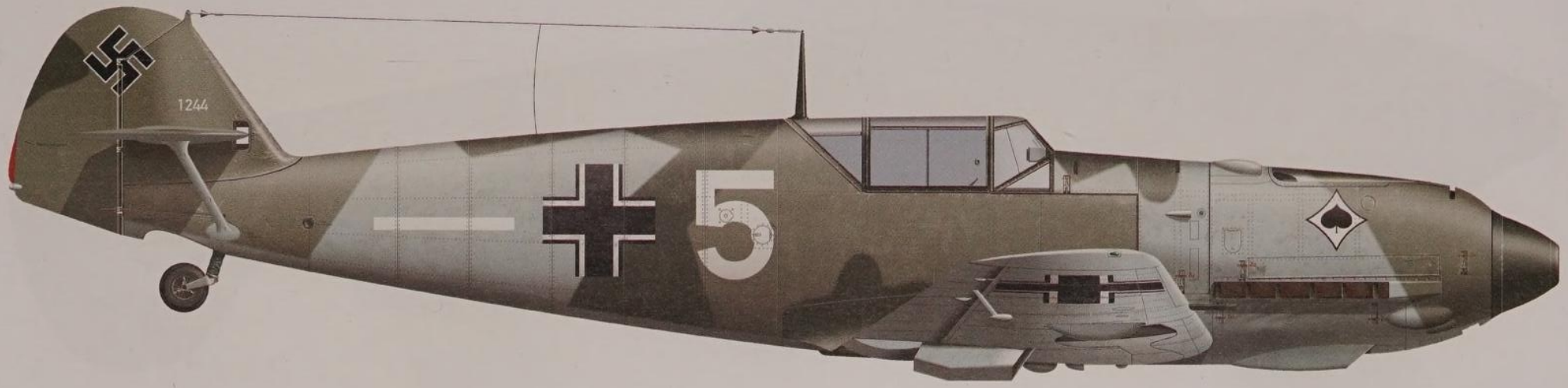


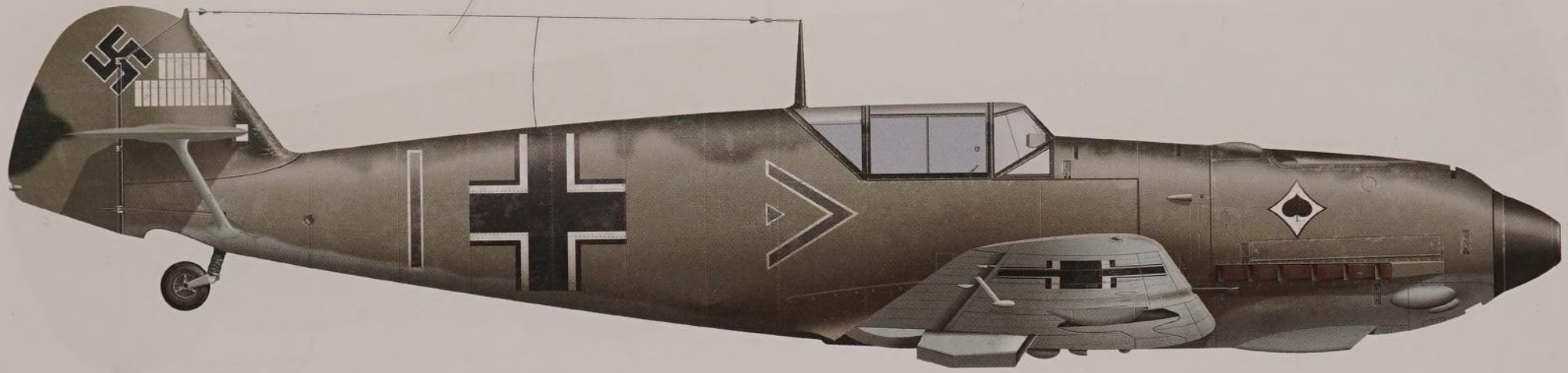
Above: Bf 109E-1, 'Double Chevron' of I./JG 27, 1939. Aircraft in splinter camouflage of RLM 70 and RLM 71 on the uppersurfaces and RLM 65 undersurfaces.

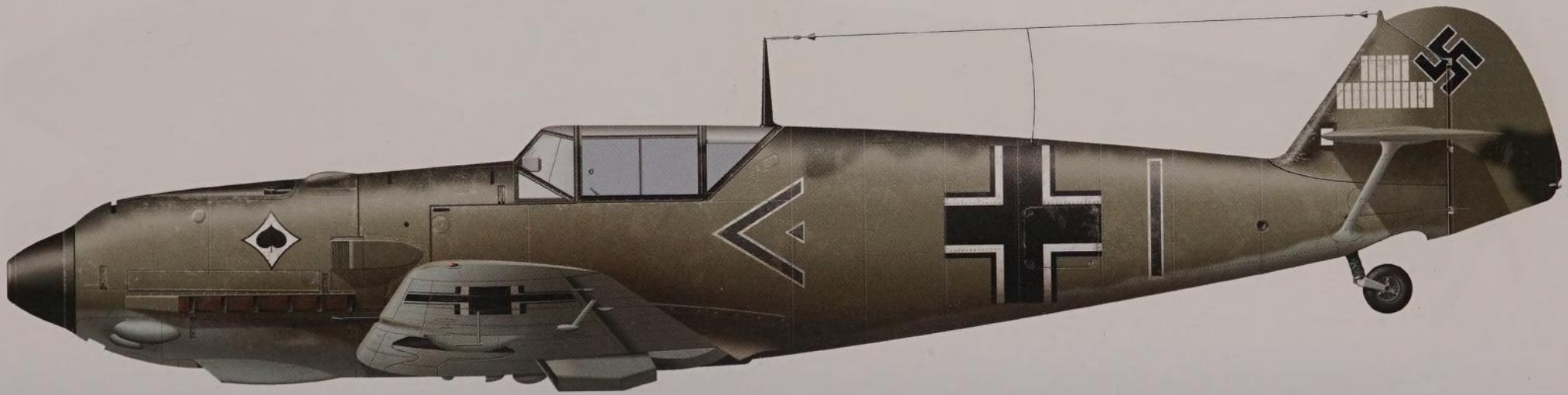
Below: Bf 109E-1, 'Red 6' of 2./JG 1. French-German border, October 1939. Aircraft in splinter camouflage RLM 70 and RLM 71 on the uppersurfaces and RLM 65 undersurfaces. Note spinner with red (wide) and white (narrow) bands.

Above: Bf 109E-3, 6-119 of 1.J/88, Spain, spring 1939. Personal aircraft of Hptm. *Siebet Reents,* Staffelkapitän *of the unit. Aircraft RLM 62* Grün *(Medium Green) on the uppersurfaces and RLM 65 undersurfaces.*

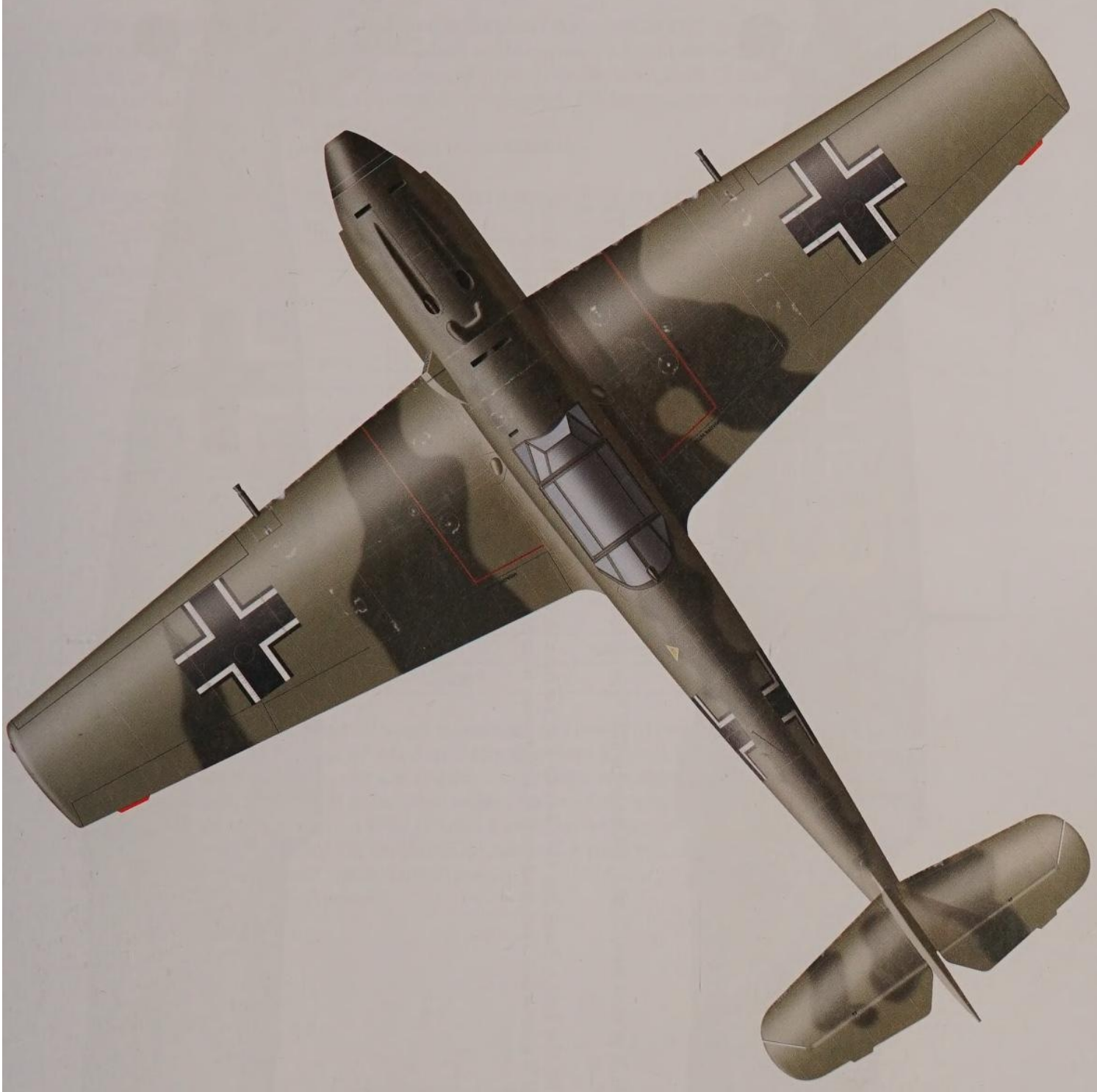
Below: *Bf 109E-3, W.Nr. 1244, 'White 5+—' of4./JG53, French-German border, October 1939. Personal aircraft of* Uffz. *Stefan Litjens. Aircraft in non-standard camouflage. Uppersurfaces in non-regular patches of RLM 02* Grau *(Grey), RLM 71 and RLM 65, with RLM 65 undersurfaces.*







This and opposite page: *Bf 109E-3 of III./JG 53, France, 25 May 1940. Personal aircraft of Hptm. Werner Mölders, the* Gruppenkommandeur *of the unit. Aircraft in RLM 02, with RLM blotches on uppersurfaces, with RLM 65 undersurfaces. 18 kill bars on the fin, in white.*



***Above**: Bf 109E-3, 'Yellow 8' of 3./JG 76, at Rhein-Main, October 1939. Aircraft in RLM 70 on uppersurfaces (but splinter camouflage of RLM 70 and RLM 71 is also possible) and RLM 65 undersurfaces.*

***Below**: Bf 109E-3, W. Nr. 1559, 'White 1' of 1./JG 1, France, June 1940. Personal aircraft of* Hptm. *Wilhelm Balthasar. Aircraft in RLM 02 and RLM 71 splinter camouflage uppersurfaces, with RLM 76 undersurfaces. Fuselage sides with RLM 02 blotches. White band on the spinner. Kill bars (in form of arrow) in black with aircraft type in white. Note later style canopy.*

Bf 109E-3a (ausländisch) –export version

This sub-type was equipped with a modified DB 601 Aa engine of 1175 hp. Exported aircraft had different cockpit installations. Many of them were built without wing armament.

The prototype for the export version was Bf 109E-3, W.Nr. 1797, D-IRTT (later CE+BL). It was converted into the export version in early 1939. All systems and equipment not allowed for export were removed.

Aircraft delivered to countries differed in their details.

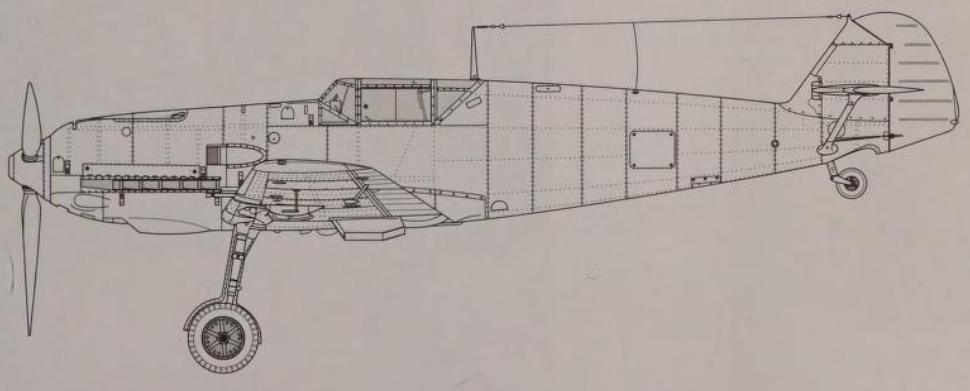
Provisional (not complete) list of the Bf 109Ea and Bf 109E for export

Country	Quantity	Delivery	Remarks
Bulgaria	10	1941	WNF Factory
	9	1941	
Japan	4	1940	
	2 (5)	1941	Bf 109 E-7
Yugoslavia	73	1939-1940	Export version. No wing armament
Romania	11	1940	Converted from used aircraft
	39	1941	
	15	1942	
Switzerland	56	1939	Export version. Delivered with no armament and radio equipment
	24	1940	
Spain	44	1939	Various models, left by the Legion Condor
Slovakia	30		Used former *Luftwaffe* aircraft
USSR	3 (5)	1941	

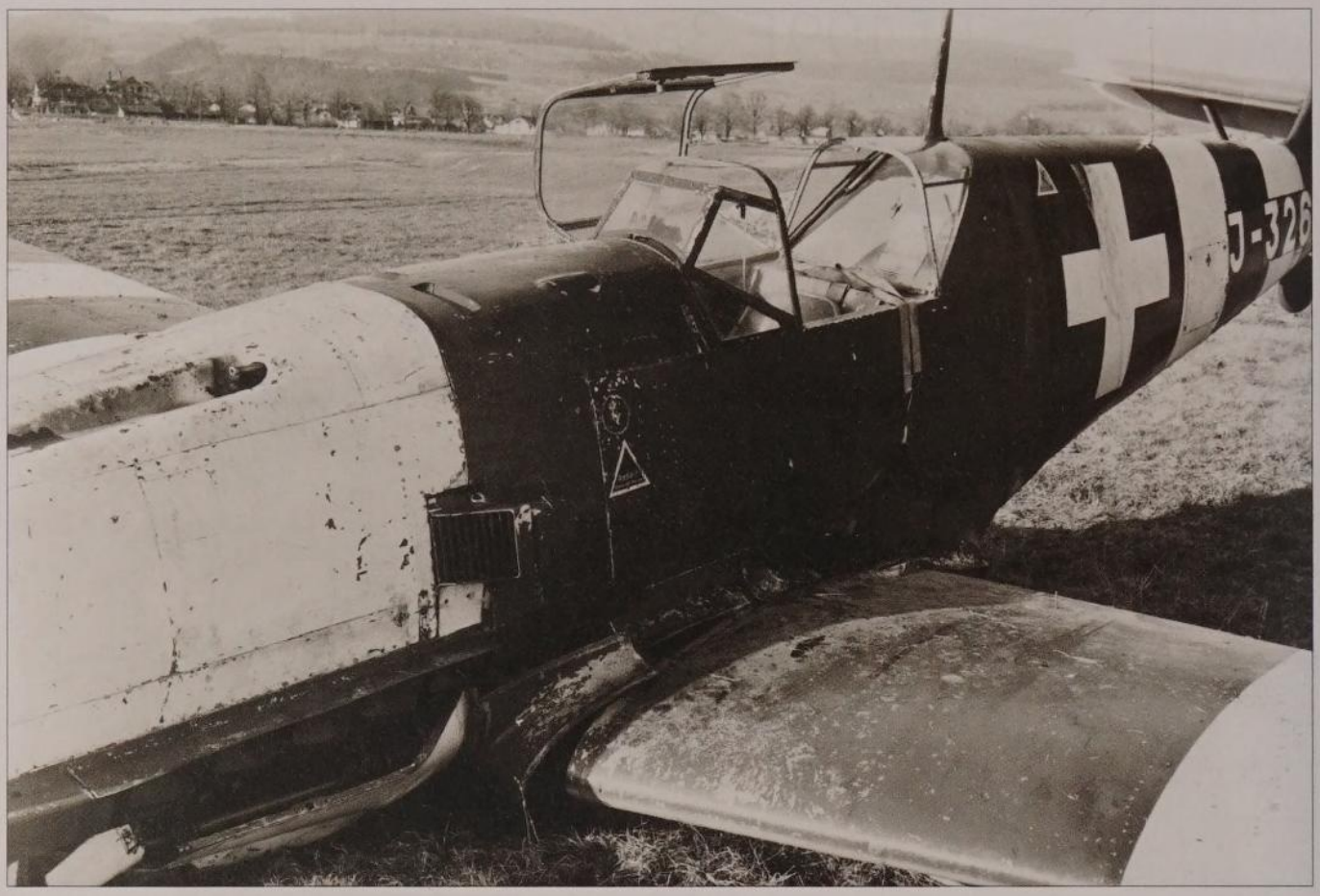
Swiss Bf 109E-3a aircraft had different armament, consisting of two 7.45 mm Eidgenossische Waffenfabrik (EW) MG 29 Machine. Troughs were 4 cm (1.6 inches) wider than on the German Bf 109E. Also, the top engine cover blister was deleted. Wing armament consisted of two FF/K Oerlikon guns. Also, older version of the gun sight – Revi 3C – was used. The aircraft were equipped with DB 601 Aa engine (export version).

Swiss Emils had a different UK-style control column. A flare box was added under rear left side of the fuselage, near the seventh frame.

(See also Foreign Emils chapter)

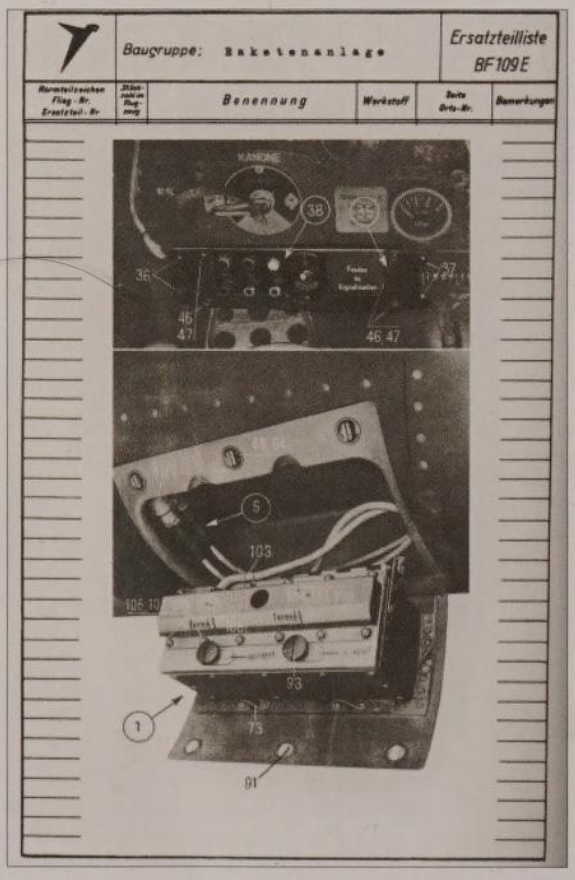


Bf 109E-3a. 1/72 scale.

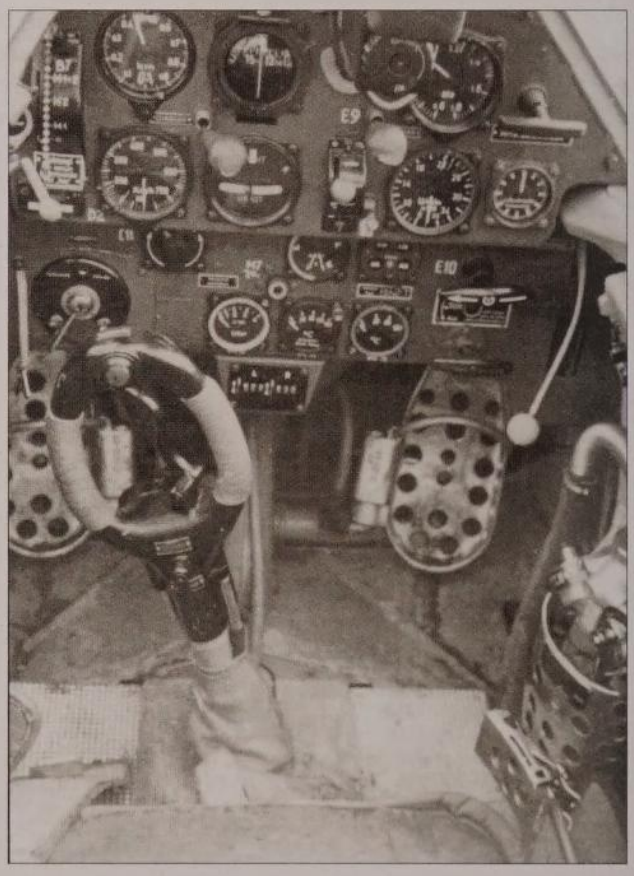


Bf 109E-3a, J-326 of the Swiss Air Force. Note deleted top engine cover blisters.

Page from the Technical Manual showing the flare box mounted below the fuselage.



Swiss Bf 109 E-3a cockpit showing Swiss instruments and UK-style control column.



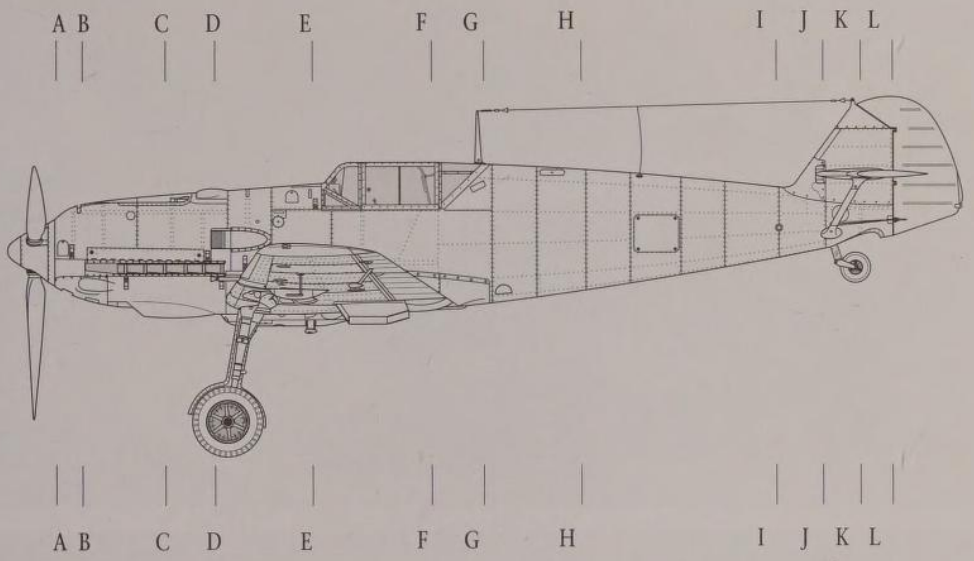
Bf 109E-2

This variant did not enter production. Photo of the Bf 109E-3, W.Nr. 1953, CE+BM, was mistakenly interpreted in many publications as Bf 109E-2 prototype.

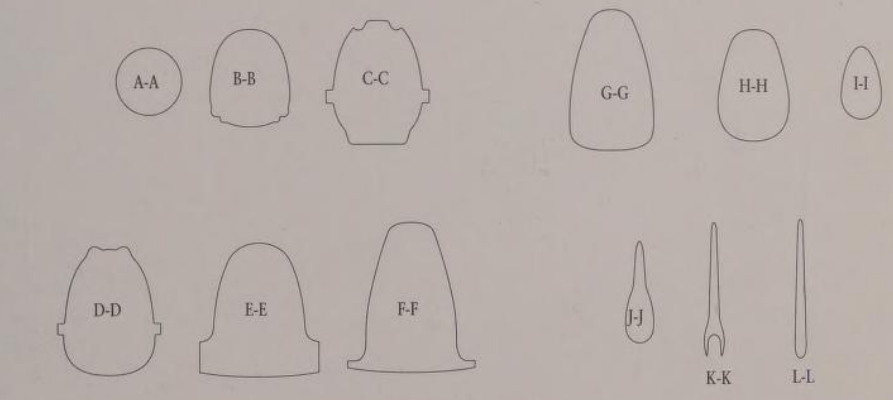
Bf 109E-4

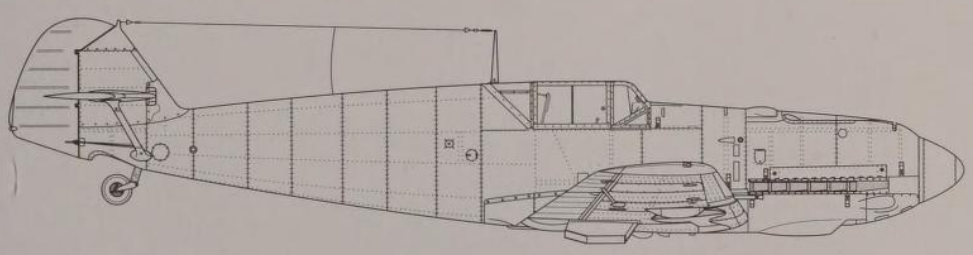
This version introduced into production all improvements made so far. Also, a new wing armament was introduced. Instead of MG FF cannons, MG FF/M were used. The new cannon was mounted in a different way and because of that it was lighter. Introduction of new shells provided a higher fire rate.

It is very difficult to find visual differences between the E-4 and late E-3s fitted with the new square canopy.

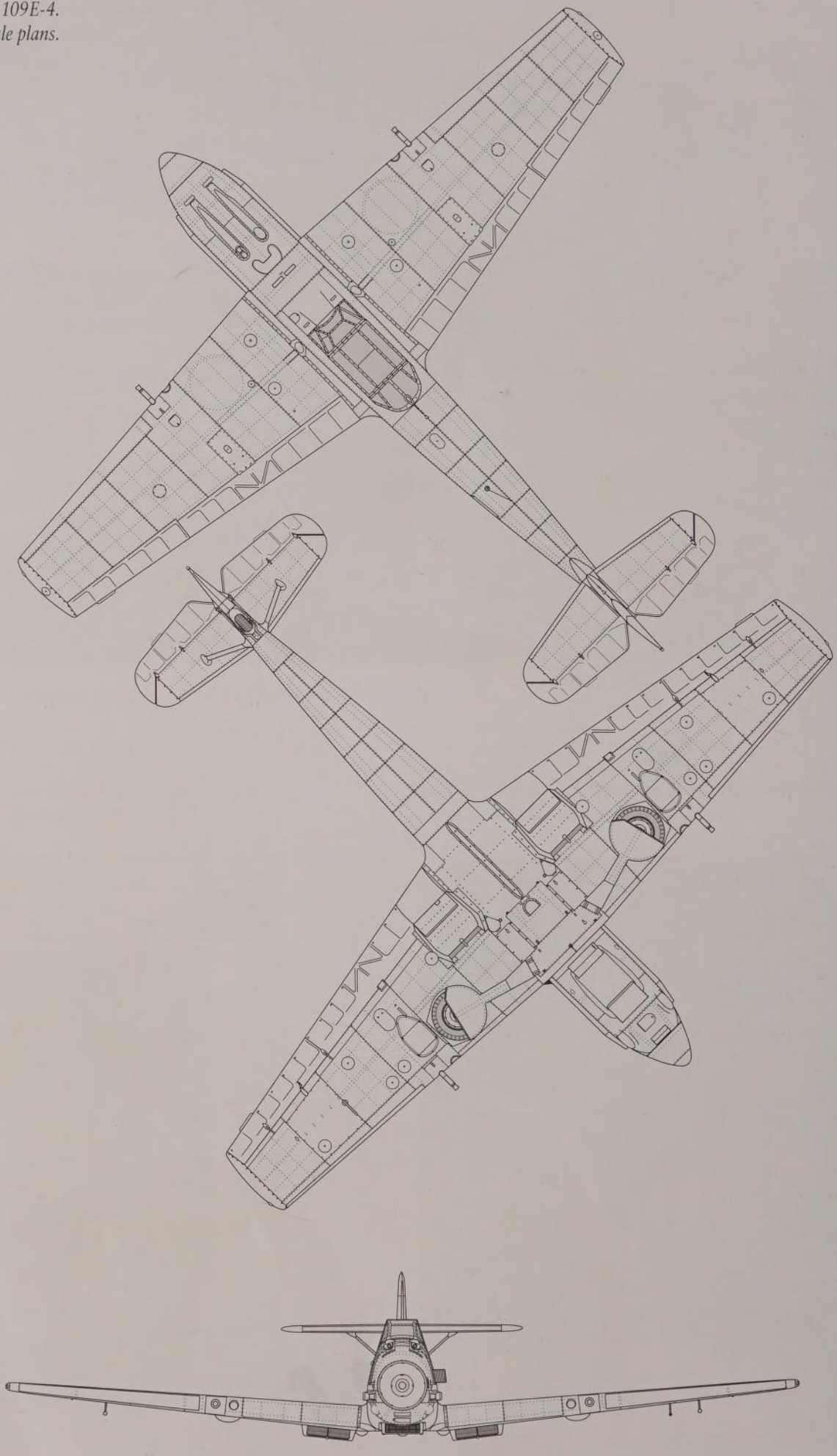


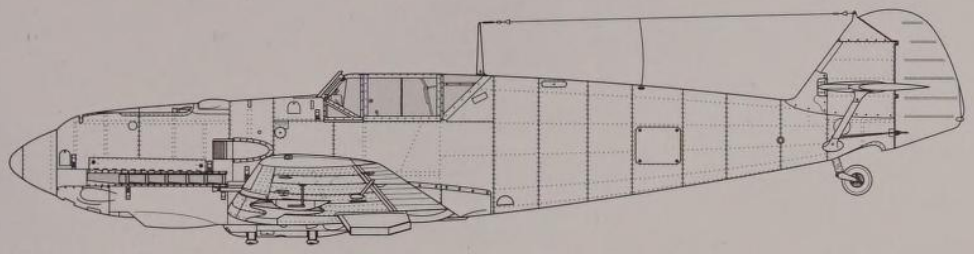
Bf 109E-4.
1/72 Scale plans.





Bf 109E-4.
1/72 scale plans.





Bf 109E-4. Aircraft with additional windscreen armour. 1/72 scale plans.

Left: *Bf 109E-4 of JG 53 ready for take off.*

Below: *A line of Bf 109E-4s awaiting delivery to the units. The second one has* Stammkennzeichen *code BA+EM. (Dénes Bernád coll.)*

Above: Port side of Bf 109E-4, ready for the take-off, France, 1940.

Below: Another Bf 109E-4 in France. Note canopy in open position.

Two photos of Bf 109E-4, W.Nr. 5398 of III./JG 26. July 1940. Personal aircraft of Adolf Galland Kommandeur *of the unit. (Meyer via Caldwell – upper, Barbas – lower)*

Starboard side of Bf 109E-4, 'Black 4' of an unknown unit. Note starter crank and flaps in lower position.

Bf 109E-4/N (E-3/N)

In August and September 1940, some E-4s were built with new DB 601N engine. The DB 601N was modified to use new and better 96-octane fuel. Emils with DB 601N engine received the new designation E-4/N. E-4/Ns powered by a new engine had slightly better performance, but fuel consumption was also higher. There was no visual differences between the E-4 and E-4/N.

Also, some of the E-3 version, were retrofitted with DB 601N engines (for example Bf 109E-3, W.Nr. 779 of 4./JG26, or Bf 109E-3, W.Nr. 1937 of 6./JG26). Most of them had the '100' triangle instead of 'C3' mostly used on Bf 109E-4/N.

	DB 601 A-1	DB 601 N	DB 601Aa
Maximum output at 2,400 rpm at ground level	990 HP (5 min)	1,020 HP (20 min)	1,045 HP (5 min)
Maximum output at 2,400 rpm at 4,500 m	1,020 HP (5 min)	1,175 HP (1 min, 2,600 rpm)	1,050 HP (5 min at 3,700 m)
Continuous output at 2,200 rpm at ground level	810 HP	910 HP (2,300 rpm)	950 HP (30 min with 2,300 rpm)
Continuous output at 2,200 rpm at 5,500 m	800 HP	950 HP (5,100 m with 2,300 rpm)	880 HP at 4,500 m

Bf 109E-4/N, W.Nr. 5819 of JG 26, France, December 1940. Personal aircraft of JG 26 Kommandeur *Adolf Galland. (via R. Michulec)*

Mechanics working on the DB 601N engine. Bf 109E-4/N of JG 26. Note additional oil tank.

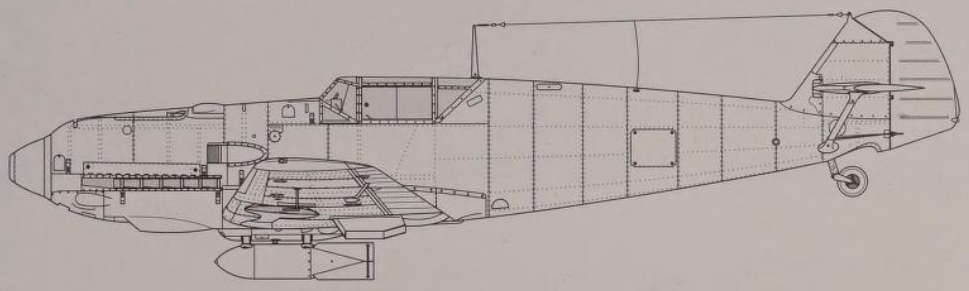
Bomb racks

At the end of 1939, the Germans realised that they needed a fighter-bomber aeroplane. Tests with a completely new bomb rack on E-4 started only in the summer of 1940. In July, production of the new fighter-bomber version started. Aircraft were equipped with the So-3 bomb installation.

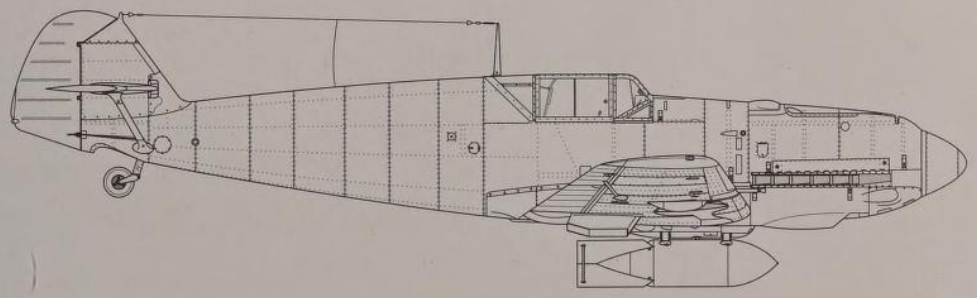
Aircraft could carry following bombs on three different bomb racks:
1 x SC 500 kg bomb;
1 x SD 500 kg bomb;
1 x SC 250 kg bomb;
1 x SD 250 kg bomb;
4 x SC 50 bombs;
96 x SD 2 (2 kg) bombs.

Bomb racks:
a. ETC 500 (*Elektrische Trägermittel für Cylinderbomben)* could carry SC 250, 500 or SD 250, 500 kg bombs;
b. ETC 50 VIII for 4 SC 50 kg bombs;
c. Bomb carrier for SD 2 bombs.

These versions were designed:
Bf 109E-1/B;
Bf 109E-3/B;
Bf 109E-4/B;
Bf 109E-4/N/B.



Bf 109E-1/B with ETC 500 and SC 250 bomb. 1/72 scale.

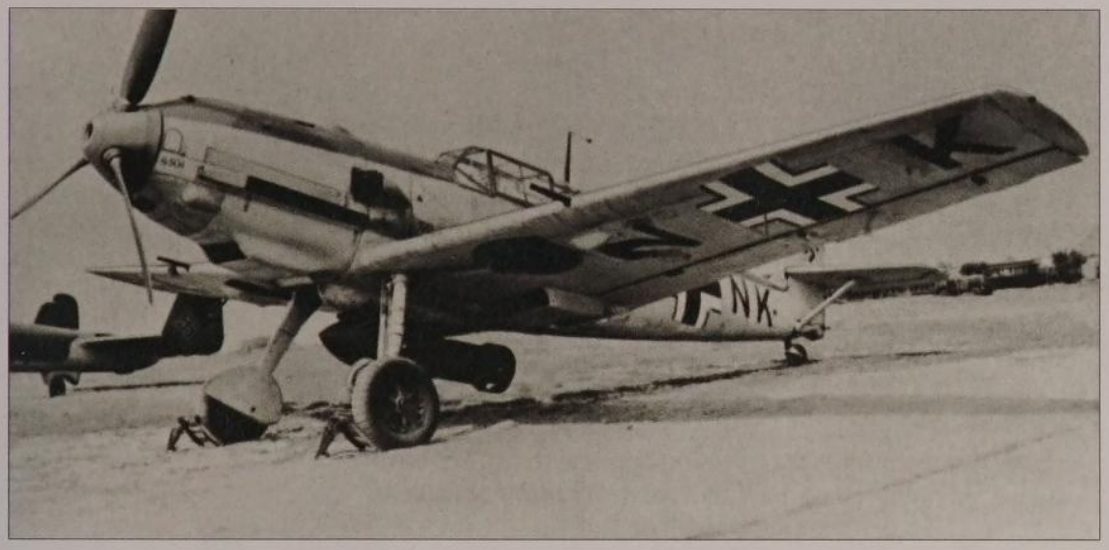


Bf 109 E-1/B with ETC 500 and SD 500 bomb. 1/72 scale.

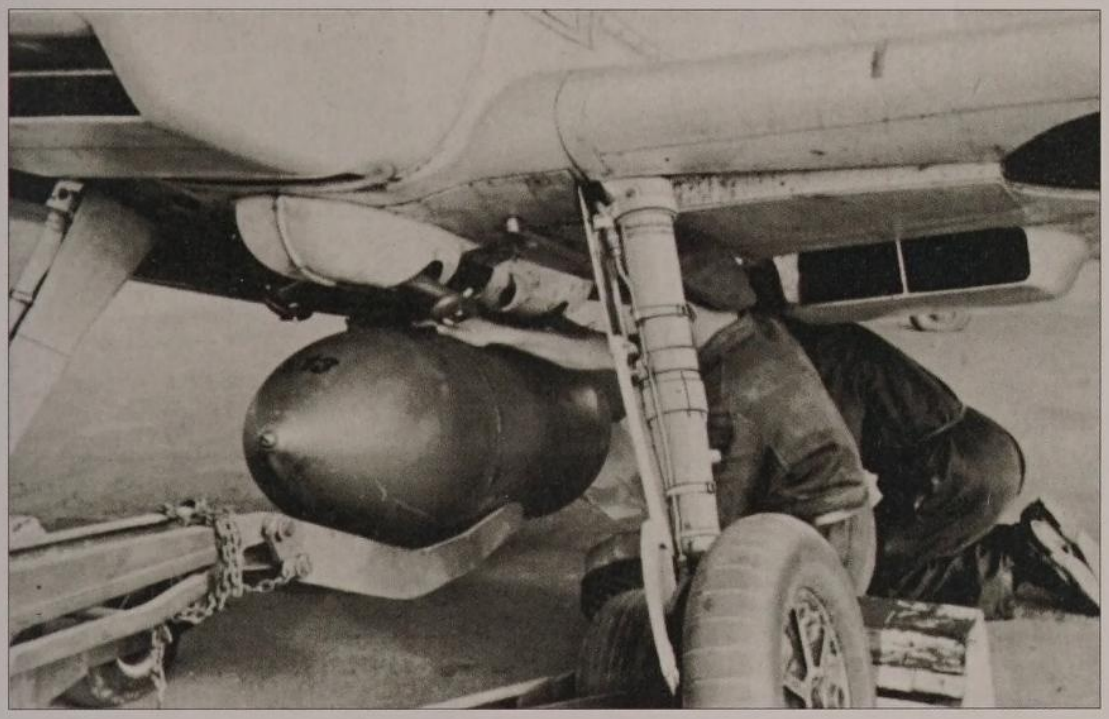
Bf 109E-4/B with ETC 500 and SD 250 bomb.

Bf 109E-3/B, 'White E' with ETC 50 VIIId and four SD 50 bombs.

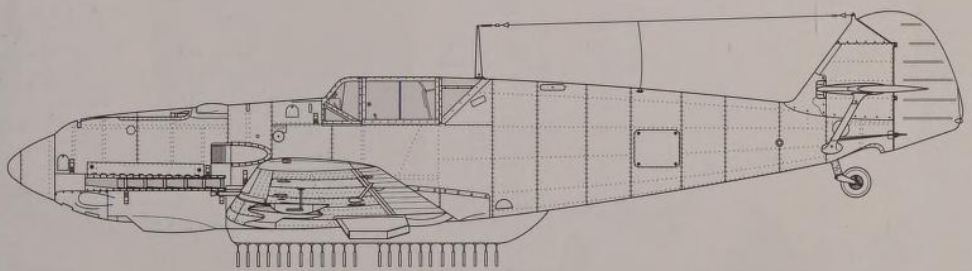
Bf 109E-7 with SD 2 bomb container.



Bf 109E-4 (probably CA+NK, W. Nr. 1361, in service with E-Stelle Rechlin in June 1940) during tests of ETC 500 bomb rack and with SC 250 bomb attached. (Technical Manual)



Bf 109E-4 during tests of ETC 500 bomb rack and with SD 250 bomb attached. (Technical Manual)



Bf 109E-7 with SD 2 bomb container and bombs attached. 1/72 scale.

Auxiliary tank

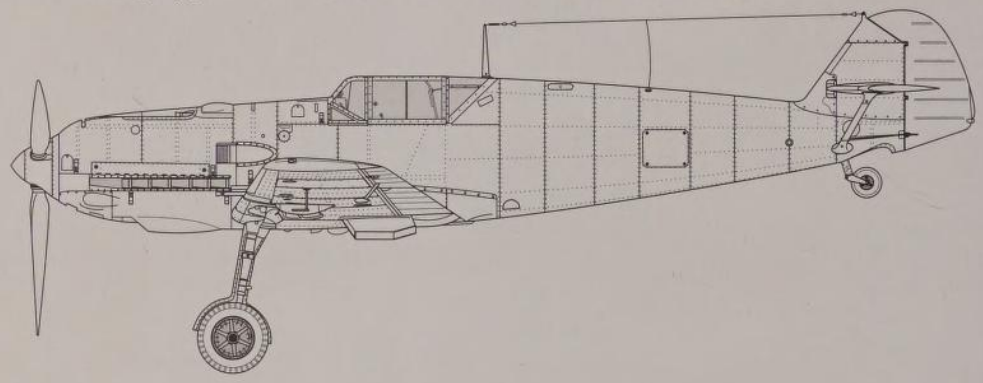
In November 1940, the RLM ordered from the WNF factory production of 500 sets of racks to carry a 300 litres auxiliary tank for the E-4. Also, the RLM ordered 550 sets for conversion of E-1s to E-4 standard. That programme was continued until July 1941, and aircraft modified in that way were delivered to mostly to *Sturm Staffels*.

Bf 109E-5

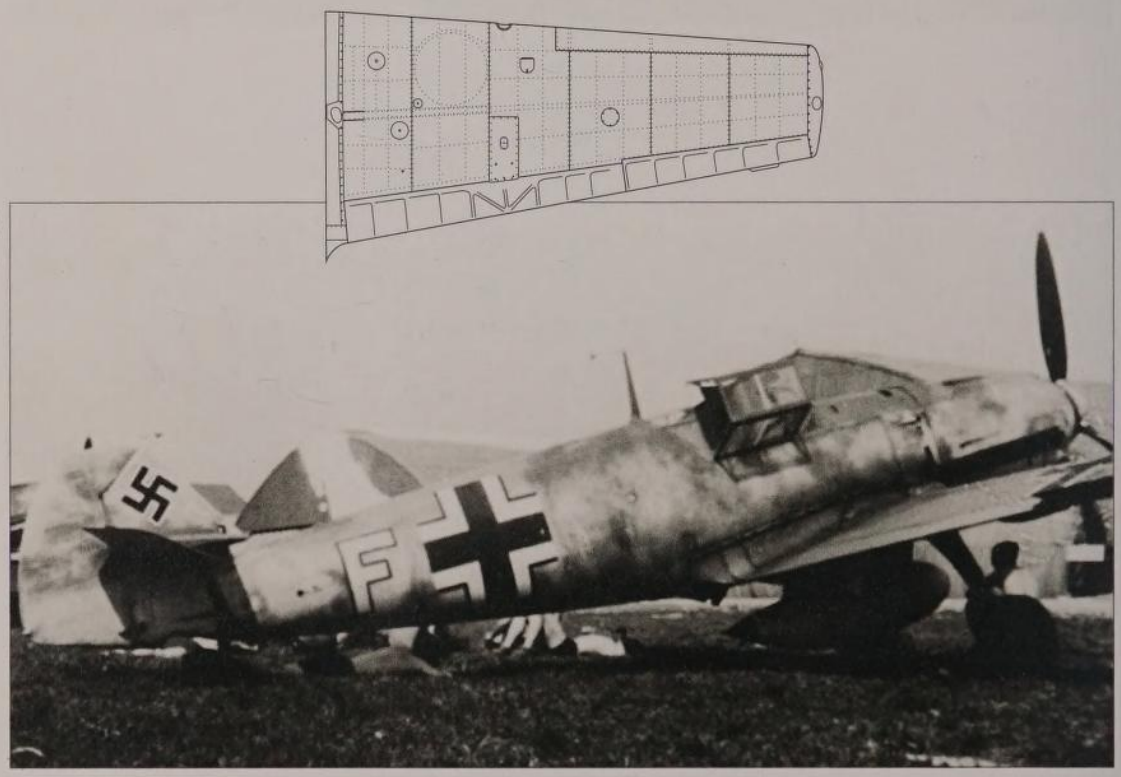
E-5 was a reconnaissance version, similar to the E-1 with cameras installed behind the cockpit. For reconnaissance missions the radio equipment in the fuselage was replaced with a Rb 21/18 camera.

Bf 109E-6

Bf 109E-6 was an attempt to further develop the E-5 with the DB 601N engine. The aircraft was equipped with two HK 12.5/7 x 9 motorized cameras.



Bf 109E-6. 1/72 scale.



Bf 109E-6, 'Yellow F'. France, 1942.

Above: Bf 109E-3/N, W.Nr. 779, 'White 3 + —' of 4./JG 26, France, 1940. Personal mount of Fw. *Wilhelm 'Willi' Roth. Aircraft RLM 02 and RLM 71 uppersurfaces and RLM 76 undersurfaces. Yellow bands on the spinner. Note high-octane (100) fuel triangle.*

Below: Bf 109E-3, W.Nr 936, or more probably W.Nr. 2764 of JG 26. July 1940. France. Personal Aircraft of Adolf Galland. Aircraft RLM 02 and RLM 71 upper-surfaces and RLM 76 undersurfaces. Note the aircraft has the earlier style canopy.

***Above**: Bf 109E-4, 'Yellow 1+~' of 9./JG 52. France, autumn 1940. Aircraft in RLM 02 and RLM 71 uppersurfaces with RLM 76 undersurfaces. Fuselage sides heavily mottled with RLM 02/RLM71. White spinner.*

***Below**: Bf 109E-4, 'Grey 2' of II./JG 53, France, August 1940. Personal aircraft of Fw. Christian Hansen. Aircraft in RLM 02 and RLM 71 uppersurfaces with RLM 76 undersurfaces. Fuselage sides heavy mottled with RLM 02. Red band around engine cowling.*

Bf 109E-7

Bf 109E-7 was put into production in September 1940. Many modifications of interior systems were made. Visual difference of this versions was the external fuel tank. This tank could be carried on ETC 500 IXb and ETC 5 – VIId racks.

Also, as standard, a DB 601N was fitted, but restricted supplies of that engine meant that some E-7s used the DB 601A. Because of that, sometimes standard E-7 was designed E-7/N and aircraft with DB 601A as E-7.

All E-7s had a spinner with faired cover.

Some E-7s (probably those built in the Fieseler factory) received a different supercharger air intake. similar to that used on the Bf 109 T version.

Many of the E-7s were converted to this standard from older versions, and W.Nr. were retained.

Factory modifications

E-7 was the first Messerschmitt aircraft which was designed to use additional modifications.

Modifications used on E-7:

- Bf 109E-7/U1 – armoured oil cooler,
- Bf 109E-7/U2 – additional armour of engine cowling and wing radiators plus self-sealing fuel tank,
- Bf 109E-7/U3 – 2x RB 12.5 plus 300l additional tank and FuG 17 radio installation,
- Bf 109E-7U4 – two gun cameras BSK 16 installed in the wings
- Bf 109E-7/Z – GM 1 installation and engine prepared for GM 1 injection.

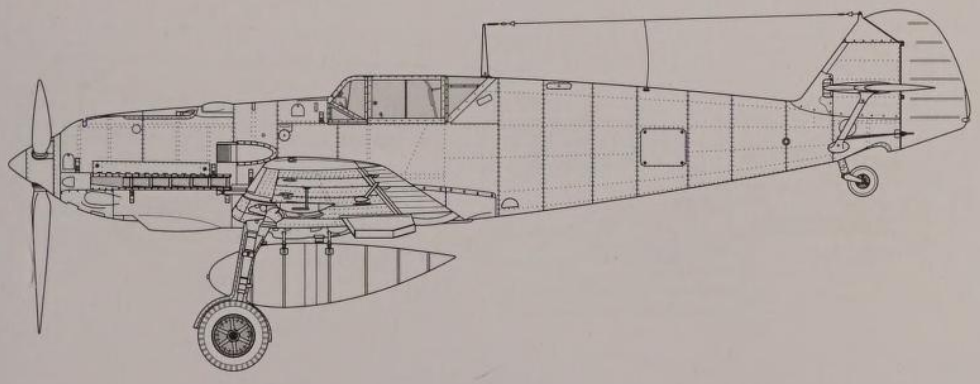
GM 1 system

The suffix 'Z' indicated that aircraft was equipped with a GM 1 system (also called 'Mona'). This system increased engine output above its maximum boost altitude. The increase for the DB 601N engine was about 250-280 hp at 8,000 m, which meant about 100 km/h increase in speed. GM 1 system injected oxygen into the engine. It was not permitted to use the system below 6,500 m and its use raised the fuel consumption.

Notes that many of the older Emils were converted to E-7 version, (for example Galland's Bf 109E-4/N, W.Nr. 5819, which was converted to E-7/Z standard).

It is necessary to say something about the spinner modifications. It is very difficult to say when the first spinners with a faired cover were used. For sure there are photos showing E-4s with such spinners. The E-4 fairing cover was an add-on feature, whereas E-7 aircraft spinners with covers were produced as a set.

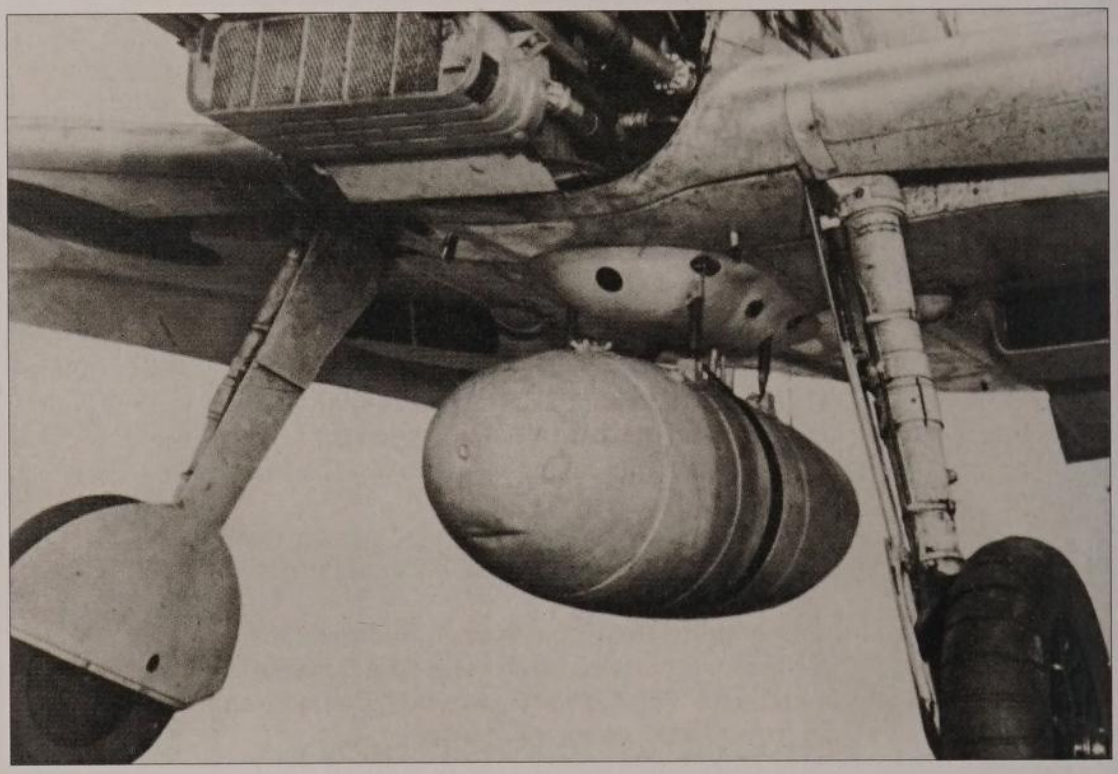
During repairs, many of older Emils received the new faired spinner.



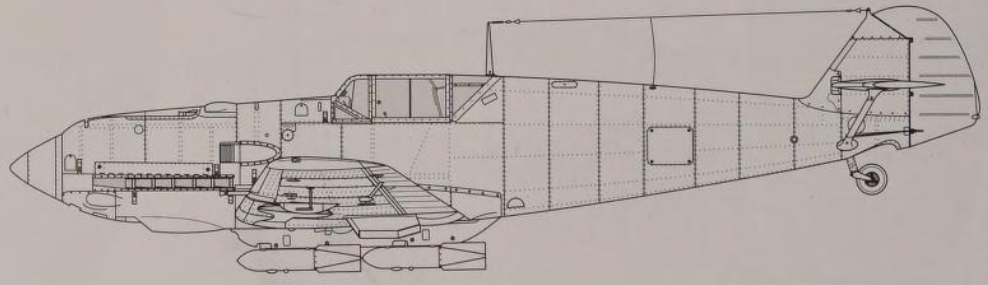
Bf 109E-7. 1/72 scale.

Bf 109E-7 prototype (CI+EJ, W.Nr. 3744) in flight.

Bf 109E-7 additional fuel tank installation during tests. (Technical manual)

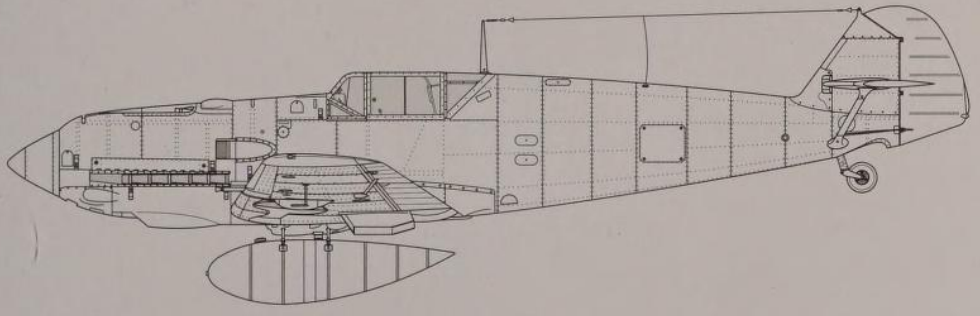


Bf 109E-7 with ETC 50 VIIId and SC 50 bombs. 1/72 scale.



Above: *Bf 109E-7 converted from E-1 at Erla Leipzig factory. Aircraft found by Soviet troops near Stalingrad, winter 1943.*

Left: *Bf 109E-7/Z, W.Nr. 5819, converted from E-4/N. On this aircraft A. Galland won his 58th victory.*



Bf 109E-7/Z. 1/72 scale.

Above: Bf 109E-7/Z, 'Yellow 7'. Note GM 1 system filler caps seen below the '7'. C3 high-octane fuel triangle is also visible.

Below: Bf 109E-7 (converted from E-1), W.Nr. 3826, 'White 12 + |' of 7./JG26, March 1941, Gela, Sicily. Personal aircraft of Joachim Münchenberg.

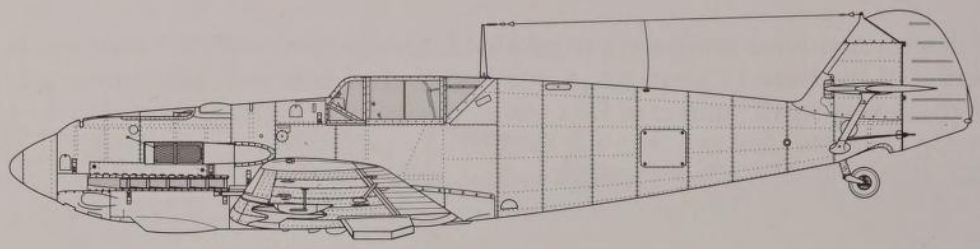
Tropical versions

For desert duty, some Emils were tropicalised. Mostly these were E-7 versions. In the first period of the Desert Campaign, a small number of E-4s were also converted. It is known that a very small number of E-9s was also converted. Emils converted to the tropical version were designed as a trop e.g. E-7/trop.

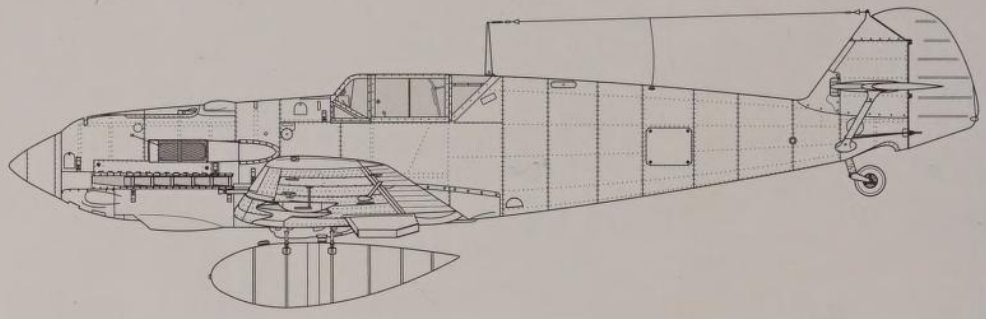
The modifications included adding a special sand filter to the air intake and tropical survival equipment for the pilot. All trop. aircraft were rebuilt from standard ones.

Wartime colour photo of Bf 109E-7/trop, 'Black 3' of 2./JG27. North Africa, Gazala, 1941.

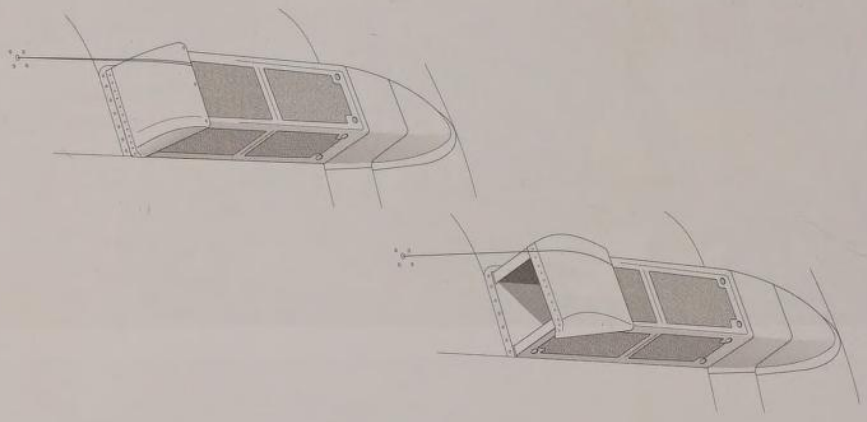
Bf 109E-7/trop, JG27. North Africa, 1941.



Bf 109E-7/trop.
1/72 scale.



Bf 109E-7/trop shown with additional fuel tank.
1/72 scale.



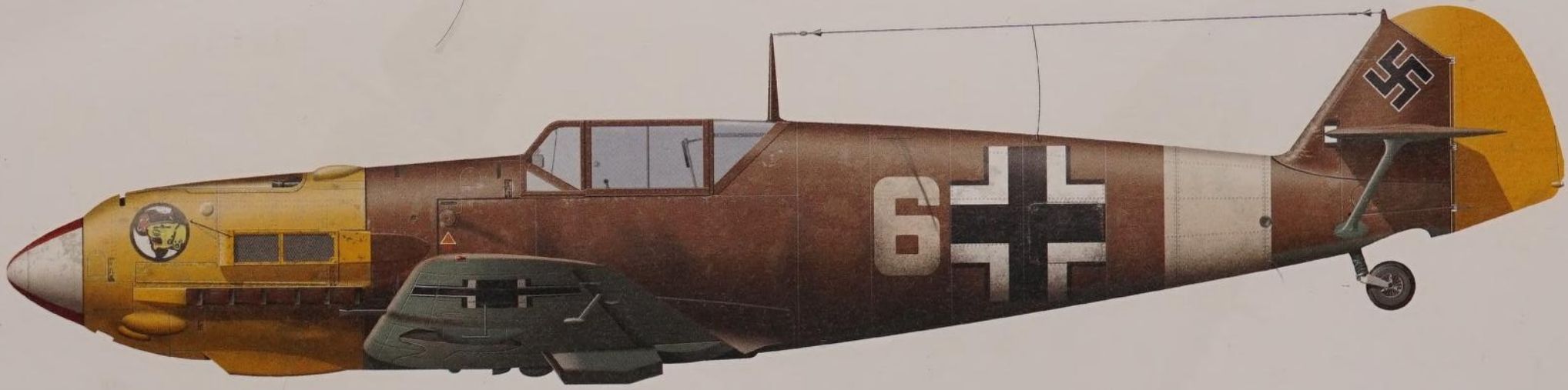
Drawing showing Bf 109E tropical filter in closed (above) and in open (below) position.
(not to scale)

Bf 109E-7/trop with engine cowling removed. Note additional oil tank installed on DB 601N engines.

Above: *Bf 109E-7, 'Black ^ + M' of 15./JG 26, Eastern Front, 1941. Aircraft RLM 74* Graugrün *(Grey Green) and RLM 75 Grauviolett (Gray Violet) uppersurfaces with RLM 76 undersurfaces. Fuselage mottled with RLM 76. Aircraft flown by Spanish volunteers of* Escuadrilla Azul. *Yellow engine cowling, lower wing tips and fuselage band.*

Below: *Bf 109E-7/B, 'Black 4' of 2./JG 51, February 1942. Aircraft in winter camouflage of washable White paint on uppersurfaces and RLM 76 undersurfaces. Yellow engine cowling and lower wing tips. Note that swastika is overpainted.*

This and opposite page: *Bf 109E-7/trop, 'White 10' of 1./JG 27, el Gazala, Libya, August 1941. Personal Aircraft of Fw. Günter Stenhausen. Aircraft RLM 79* Sandgelb *(Sand Yellow) with RLM 80* Olivgrün *(Olive green) uppersurfaces and RLM 78* Hellblau *(Light Blue). Yellow engine cowling and rudder. White fuselage band and spinner.*



Above: Bf 109E-7/trop, 'White 6' of 1./JG 27, el Gazala, Libya 1942. Aircraft RLM 79 uppersurfaces with RLM 78 undersurfaces. Engine cowling and rudder Yellow. White fuselage band. Spinner white and red.

Below: Bf 109E-7/B, with ETC 500, S9+FS of III./ZG 1, Belgorod, Soviet Union, 1942. Aircraft in RLM 74 and RLM 75 uppersurfaces with RLM 76 undersurfaces. Lower wing tips, fuselage band and engine undersurfaces in Yellow. Note additional windscreen armour.

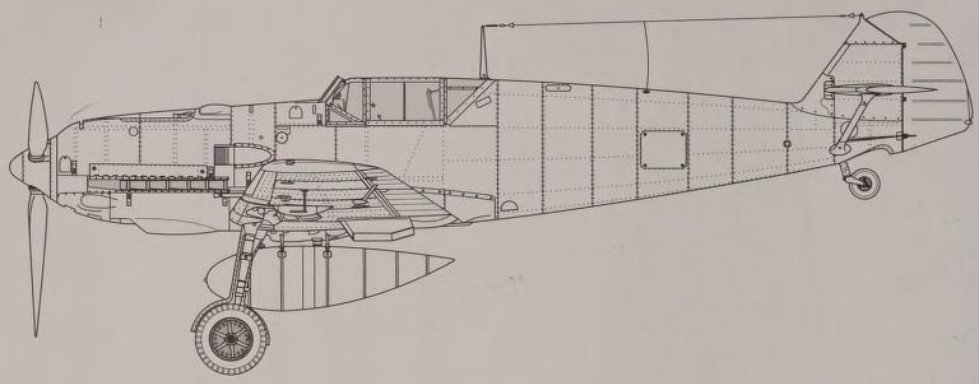
Above: Bf 109E-7/Z, W.Nr. 5819, converted from E-4, April 1941. Aircraft in RLM 74 and RLM 75 uppersurfaces, with RLM 76 undersurfaces with blotches on the fuselage in RLM 02. Engine cowling and rudder in Yellow.

Below: Bf 109E-7/Z of an unknown unit. Aircraft in RLM 74 and RLM 75 uppersurfaces, with RLM 76 undersurfaces with heavy blotches on the fuselage in RLM 02.

Bf 109E-8

Bf 109E-8 – a 'light' armament version of the E-7. Aircraft had just four MG 17 guns. Except for the wing guns, the aircraft was identical with the E-7 with DB 601N engine. Only a few aircraft were produced in September and October 1940.

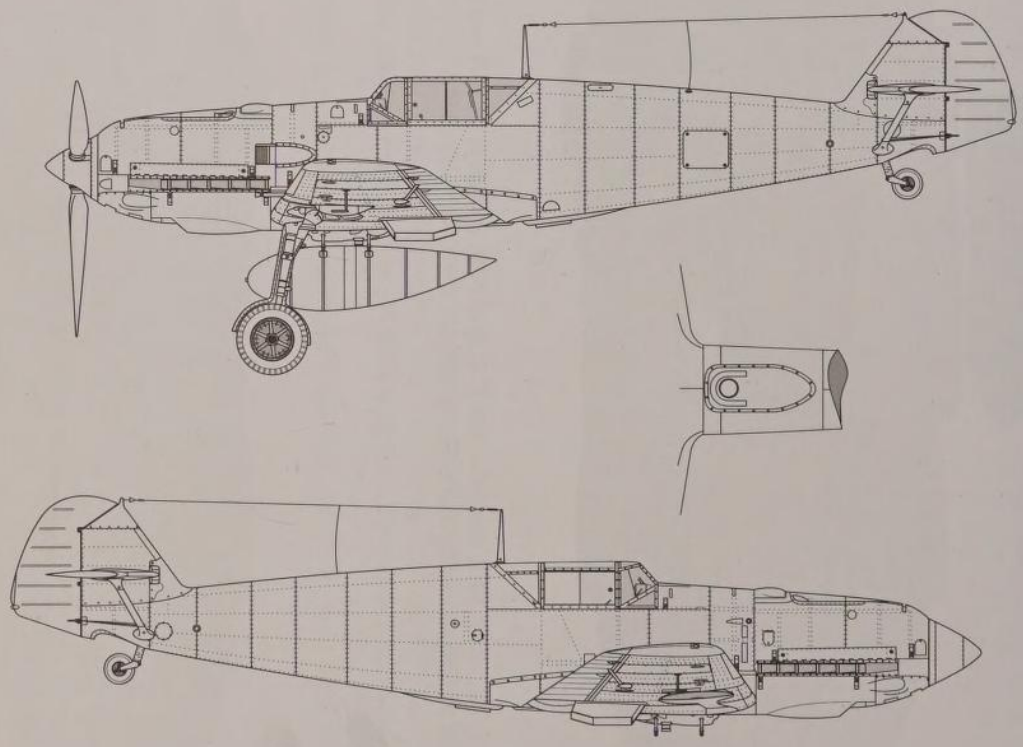
Bf 109E-8. 1/72 scale.



Bf 109E-9

The final version of the Emil, the E-9, was developed from the E-7 as a reconnaissance aircraft. In fuselage segments no 2 and no 3 an Rb 50/30 camera was mounted.

Bf 109E-9. 1/72 scale.

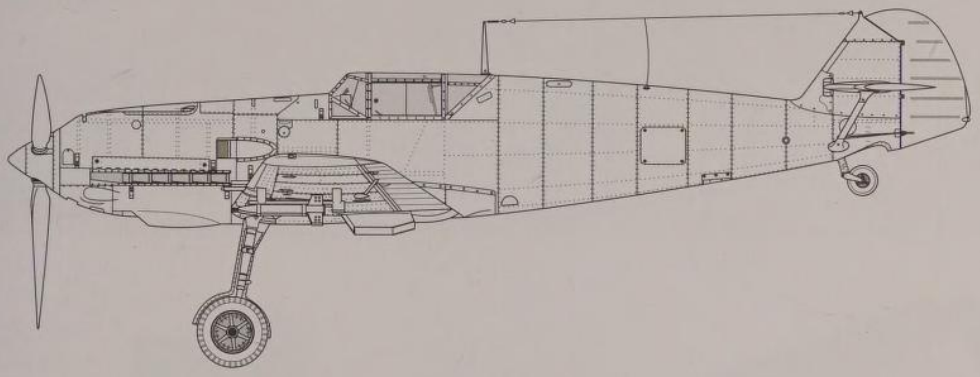


Bf 109E built in Switzerland

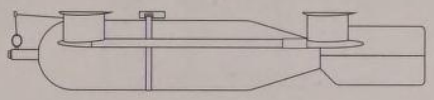
Aircraft built at the Dornier-Werke Altenrhein (Doflug) AG.

There was a license agreement between the Swiss Government and Messerschmitt, authorizing Doflug Altenrhein to manufacture eight new Bf 109E-3 aircraft using spare parts procured for the Bf 109E-3s that were delivered earlier. The parts not available as spares had to be produced by Doflug.

The Bf 109E with Escher-Wyss propellers manufactured by Doflug had a better performance between 4,000 m and 10,000 m than the original Bf 109 E-3. The aircraft were not in operational service before the end of the war. The aircraft were equipped with bomb/rocket racks under the wings.



Bf 109E built by Doflug. 1/72 scale.



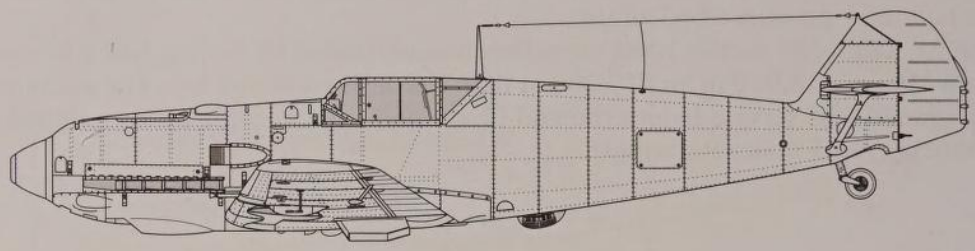
Swiss bomb.

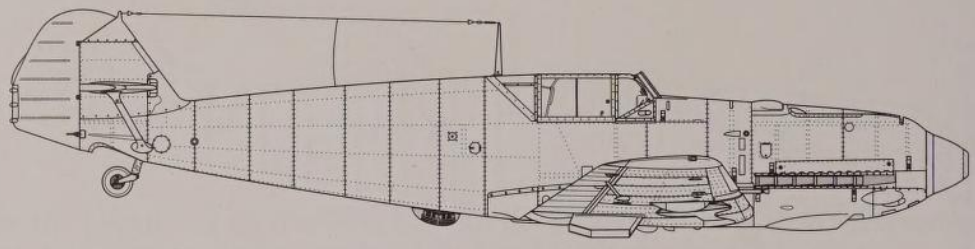
Bf 109E, J-399, built by Doflug. Note bomb racks under wings.

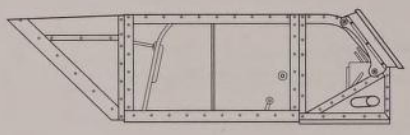
Bf 109E with Peil G IV

A small number of aircraft were equipped with the Peil G IV navigation system. Peil G IV was a long and medium range D/F set and homing device.

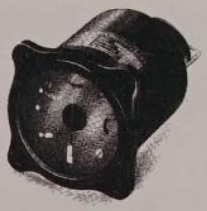
Bf 109E-4 with Peil G IV. Note canopy with additional armour and flare pistol firing orifice mounted on the starboard triangle under the cockpit canopy. (see canopy detail drawing) 1/72 scale.

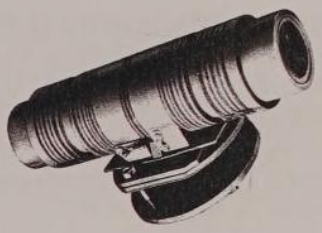




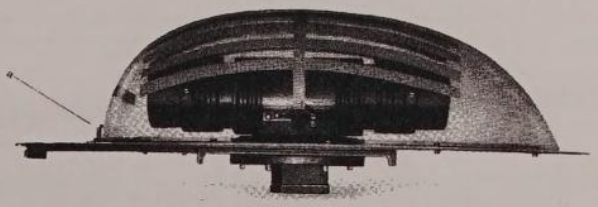


This and opposite page: *Messerschmitt Bf 109E-4 (E-7) '16', (Peil G IV), March 1942, Norway.* Uffz. *Hans-Gerd Wennekers,* Jagdgruppe Losigkeit.

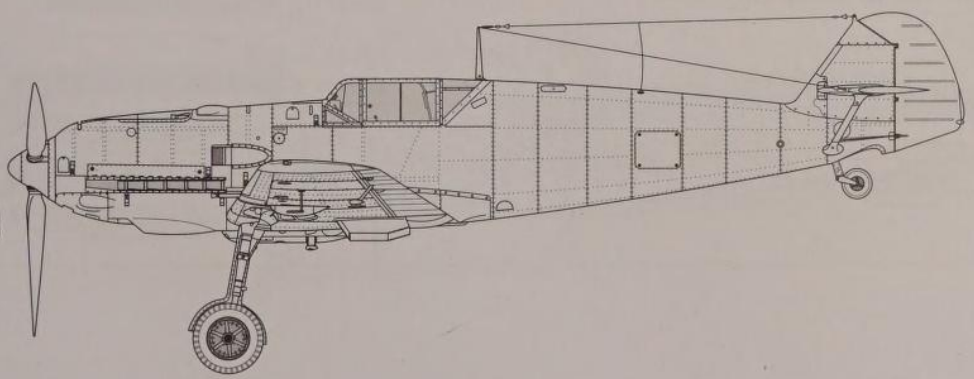




Details of the Peil G IV system.
(Technical Manual)



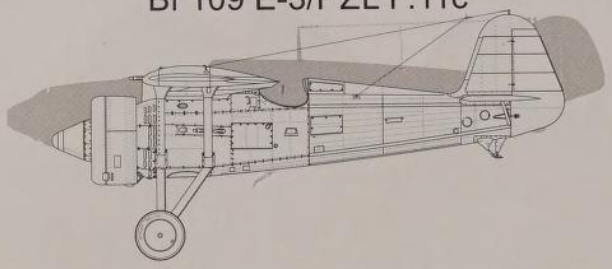
Bf 109 E with Formation Leader Radio Gear

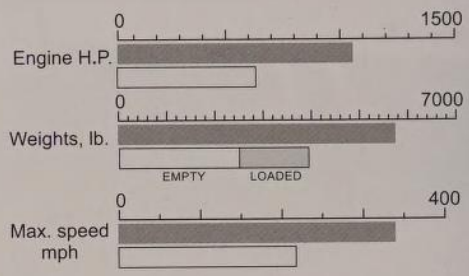


Bf 109E-4 with Formation Leader radio gear.
1/72 scale.

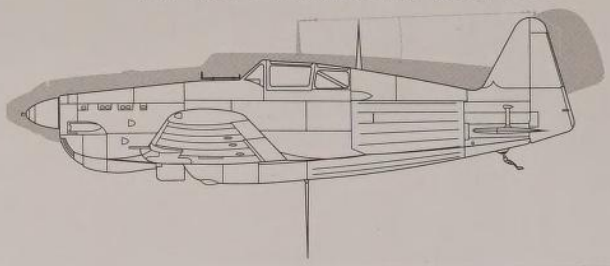
Bf 109 E comparison

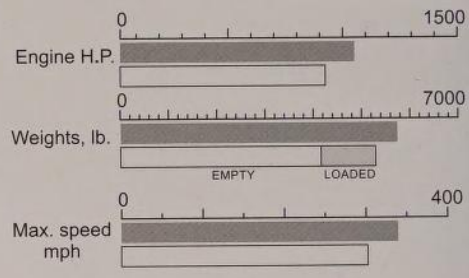
Bf 109 E-3/PZL P.11c



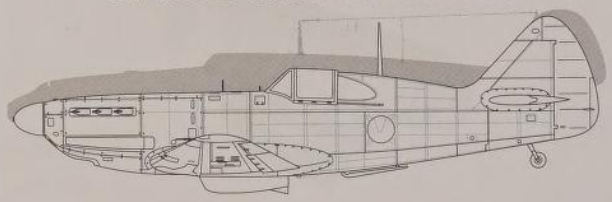


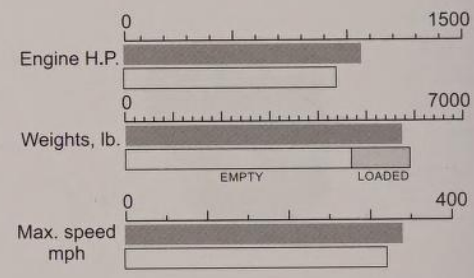
Bf 109 E-3/Morane MS.406



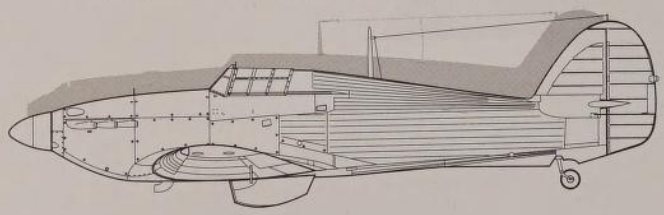


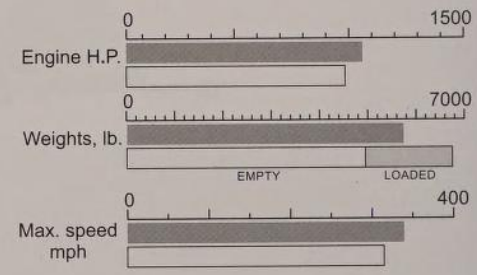
Bf 109 E-3/Devoitine D.520



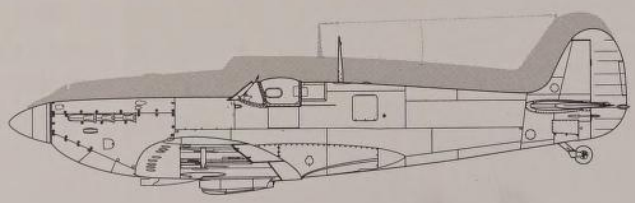


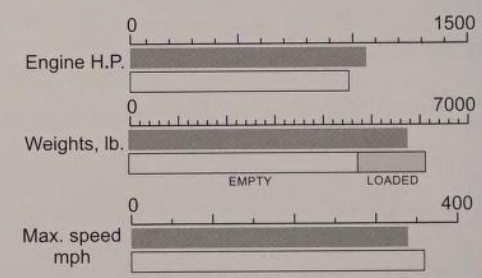
Bf 109 E-3/Hurricane Mk.I





Bf 109 E-3/Spitfire Mk.I





Bf 109E Technical Description

A single seat, single engine, all metal, low wing, cantilever monoplane with retractable undercarriage.

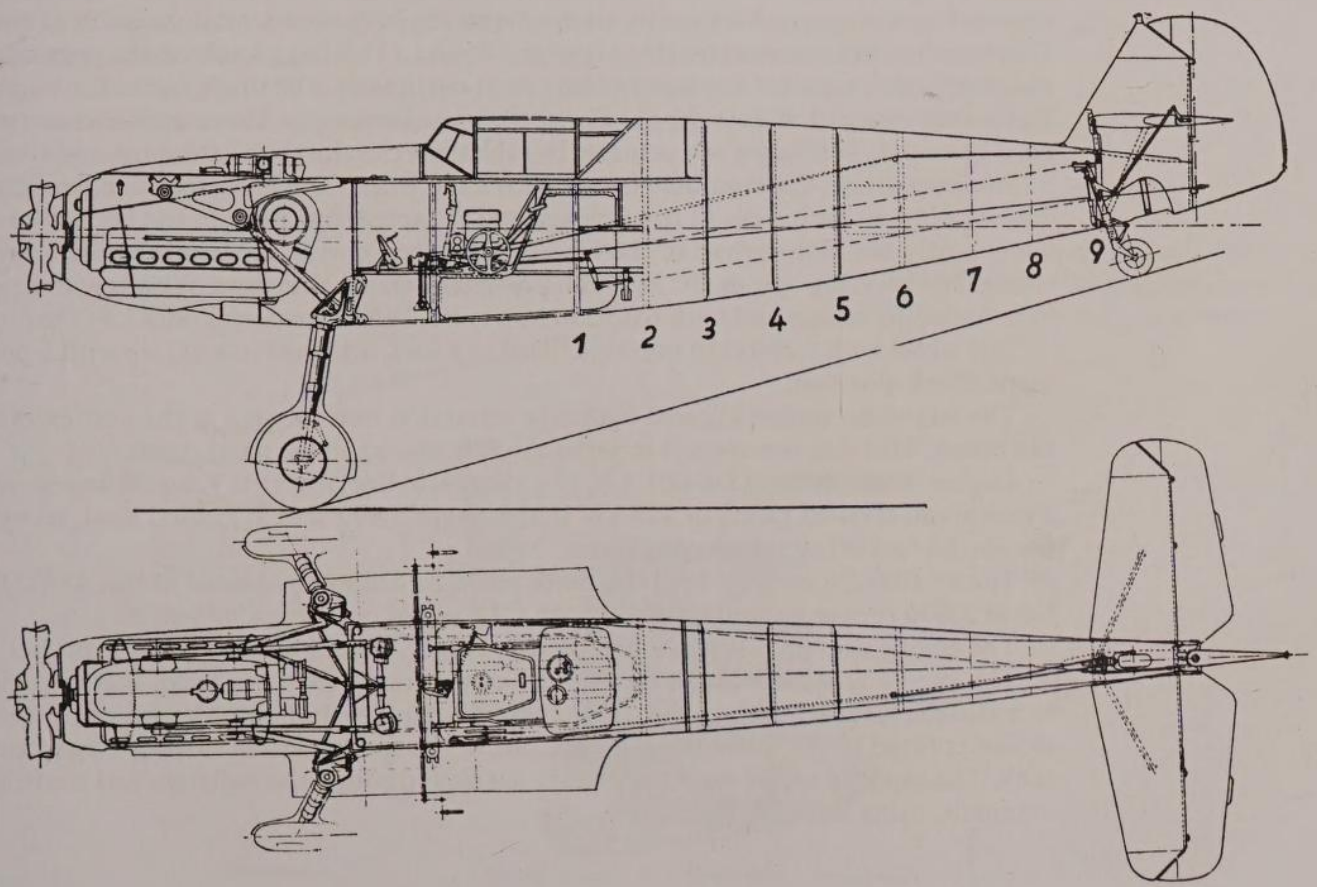
Fuselage: Duralumin semi-monococque structure of oval cross-section. The central section housed the cockpit, covered with a three-piece canopy (during the production run the canopy design was altered and reinforced) and the fuel tank compartment. The rear portion of the fuselage, built separately, was riveted to the cockpit section. The rear section consisted of two halves, joined along the upper and lower edges. Each half was made up of seven segments, stiffened with Z-section frames that featured oval-shaped cut-outs for stiffening stringers. There were five stringers in each half. The fuselage ended with an oval-section tail boom bolted onto it, which housed the tail wheel attachment and well in the lower part. The fuselage was covered with flush-riveted duralumin skin.

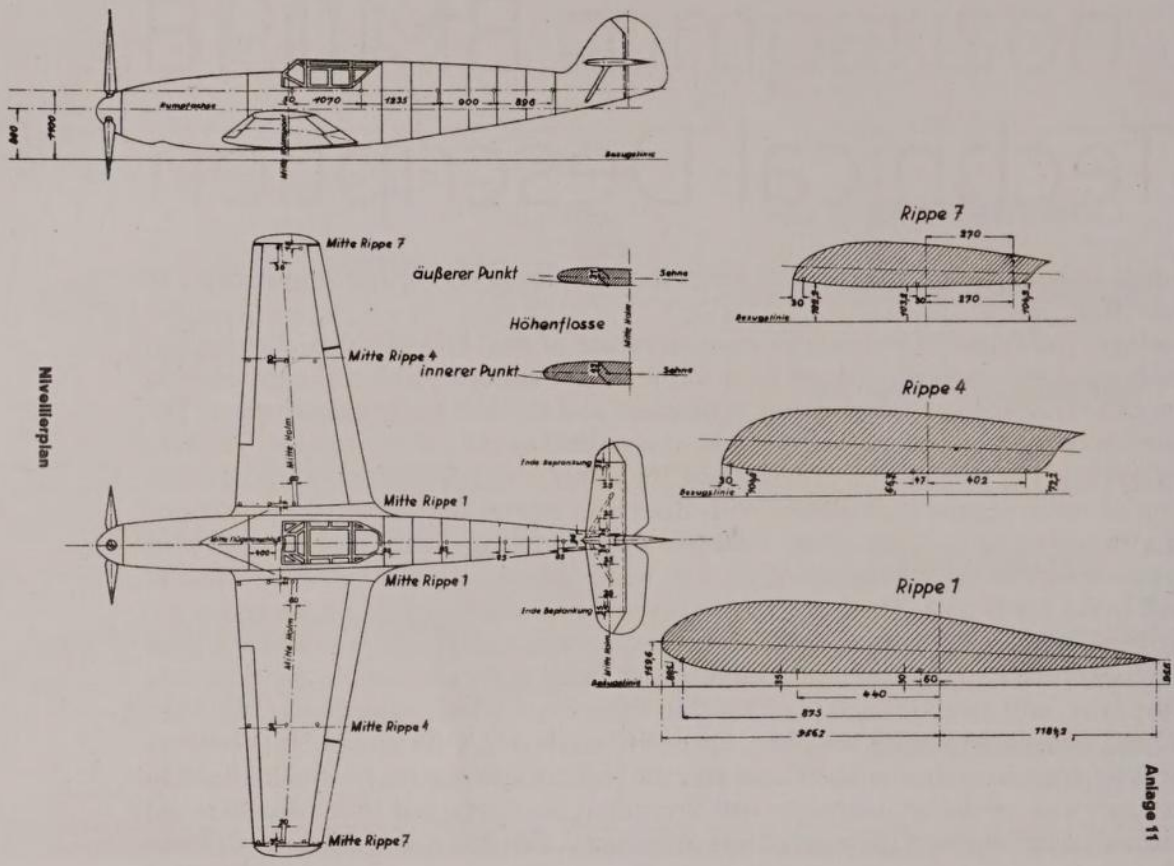
Starting with the E-4 version, armour protection was introduced for both the pilot and the fuel tank. This consisted of armour plates fitted aft of the seat, at the floor and aft of the tank, and an additional plate fixed in the cockpit hood, immediately aft of the pilot's head. The canopy, with the plate, opened to starboard, with an option to jettison it using a separate lever. In the latter case also the rear cockpit glazing (normally fixed to the fuselage) was jettisoned, complete with the aerial mast attached to it. Moreover, on some aircraft a bullet-proof glass panel was introduced, fitted in a steel frame and bolted onto the windscreen (the above protection was also retro-fitted to many earlier Bf 109E-1 and E-3 aircraft).

Wing: All metal, two-piece, single-spar, tapered with slightly rounded tips, fitted with automatic slats. Each wing was attached to the fuselage at three points. Flush-riveted duralumin stressed skin.

The wing profile was the NACA 2R1, with a thickness to chord ratio of 14.2% at the root (NACA 2R1 14.2) and 11.35% at the tip (NACA 2R1 11.35).

Bf 109E cut-away drawings. (Technical Manual)





Bf 109E dimensions data. Wing profiles are also shown. (Technical Manual)

Slotted ailerons and flaps of metal construction, fabric covered. Mass balanced ailerons, actuated by push-rods. Flaps were operated from the cockpit by a large knob that actuated a system of chains (in the fuselage) and push-rods (in wings).

Tail: Metal, with fabric-covered elevators and rudder. The horizontal tail tapered with rounded tips, supported by single steel-tube struts in oval-section duralumin fairings. Tailplane incidence was adjustable between –8° and +3° using a knob on the port side of the cockpit that actuated a system of chains and steel cables. The single vertical tail surface had asymmetric airfoil, in order to balance the propeller torque. The control surfaces were horn-balanced. The rudder was actuated by cables, the elevators by a cable/push-rod system.

Undercarriage: Conventional layout with a tail wheel. Single-leg main undercarriage was attached to both sides of the fuselage and retracted into wells in the bottom of the wing, partly faired over (half of the wheel) with metal covers. Hydraulic actuation with emergency lowering option. EC legs with pneumatic shock-absorbers. Wheels with drum-type hydraulic brakes and with 650x150 mm tyres. Wheel track was only 1.975 m.

Tail wheel with a 290x110 mm tyre fitted in a fork, attached to a EC leg with a pneumatic shock-absorber.

The tail wheel design allowed hydraulic retraction into the well at the bottom of the tail boom. This was not applied in series aircraft, the leg being fixed down.

Engine: Daimler-Benz DB 601 A-1, 12-cylinder, in line, inverted V, liquid cooled, with a maximum take-off rating of 809 kW (1,100 hp) at 2,400 rpm at ground level, set up to use the B4 fuel (87 octane leaded petrol).

The Bf 109E/N versions used the more powerful DB 601 N-l rated at 864 kW (1,175 hp) at 2,600 rpm at ground level, fed with C3 fuel (96 octane leaded petrol).

The engine drove a 3.100 m diameter three-blade, constant-speed VDM propeller.

The engine was cooled by a 1:1 mixture of water and ethylene glycol that circulated in a closed system, which consisted of two SKF (Süddeustsche Kühler Fabrik) F 465 C radiators fitted in the lower wing surface, aft of the spar, near the fuselage, and a surge tank. The capacity of the system was 65 l. Air flow through the radiators was controlled manually, using large ejector flaps.

Fuel system included a 400 l main fuel tank fitted in the compartment aft and below the cockpit floor. Late version (E-7) aircraft were plumbed to use an additional 300 litres under-fuselage drop tank.

Oil system consisted of a 36 l tank (only filled to 29.5 l), fitted in the forward fuselage, ahead of the cockpit, and an oil cooler installed under the engine.

Oil flow was controlled by a gear pump that was part of the powerplant. The system was usually filled with multi-season Stanavo 120 oil, or with Intava-Rotring, Mobilöl-Rotring, Rotring or Aero-Shell-Mittel oils.

Hydraulic system – used for undercarriage retraction and lowering. The fluid flow was controlled by a gear pump driven by the aircraft's engine. The system included a surge tank fitted in the fuselage, on the port side, aft of the engine.

Oxygen system consisted of two 2 l cylinders fitted in the upper fuselage aft of the cockpit and feeding the respirator fitted on the starboard side of the cockpit, which composed the breathing mixture depending on the altitude (at altitudes in excess of 8,000 m pure oxygen was used).

Electric system – single-conductor, screened, rated at 24 V. A 600 W Bosch generator driven by the aircraft engine plus a Varta 7.5 Ah lead battery fitted in the fifth segment of the fuselage.

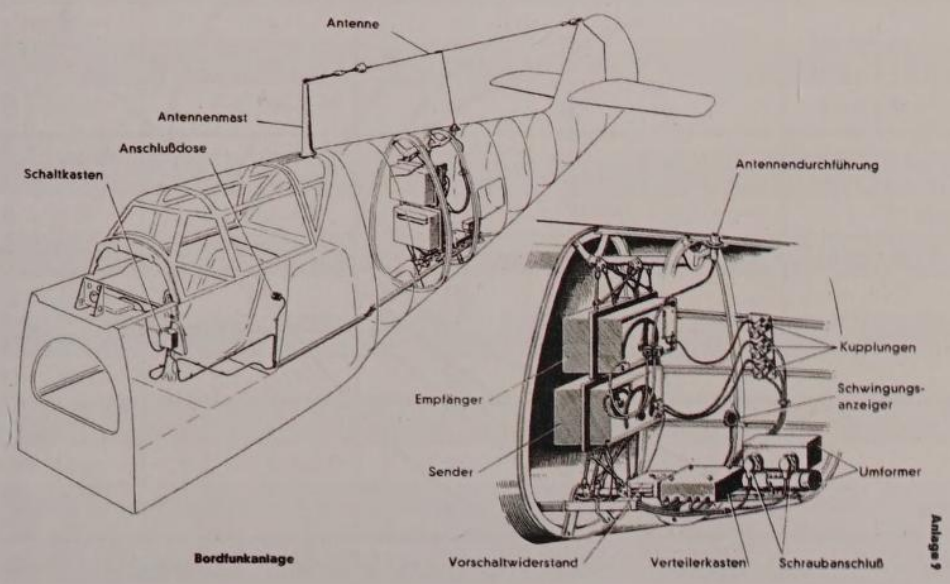
Radio system – Telefunken FuG VII transmitter-receiver set (FuG VIIa in late aircraft), operating in the 2,500-3,750 kHz range, fitted in the third segment of the fuselage. The set included the E5a receiver and the S6b transmitter. Power was supplied by the U4b/24 converter.

Gun armament – standard armament of the Bf 109E consisted of four 7.9 mm Rheinmetall-Borsig MG 17 machine guns, or two MG 17 and two 20 mm Rheinmetall-Borsig (Oerlikon licence) MG FF (E-3 variant) or MG FF/M (later variants) cannon.

Two MG 17s were fitted in the front fuselage above the engine, with 1,000 rounds per gun. The fuselage-mounted MG 17s were fitted with synchronising gear to fire through the propeller disc. Two MG 17s with ammunition belts (500 rounds per gun), or two MG FF (MG FF/M) cannon with T 60 FF ammunition drums (60 rounds per cannon) were mounted in the wings.

The armament was fired using a single trigger button on the control stick grip, KG 12 A type. A Revi C/12D reflector gunsight was used.

Bomb armament – the aircraft could be modified for fighter-bomber duties by fitting a centreline bomb carrier with the Sch. 500/IXb rack that could carry a 250 kg bomb (the Sch. 500/IXb could accept 500 kg bombs, but the short main wheel legs did not give enough clearance for such bombs, and their use was strictly prohibited to avoid their collision with the ground), or with four ETC 50/VIIId racks for 50 kg bombs. When such armament was fitted, an additional control panel for the bomb racks and fuses was fitted in the cockpit

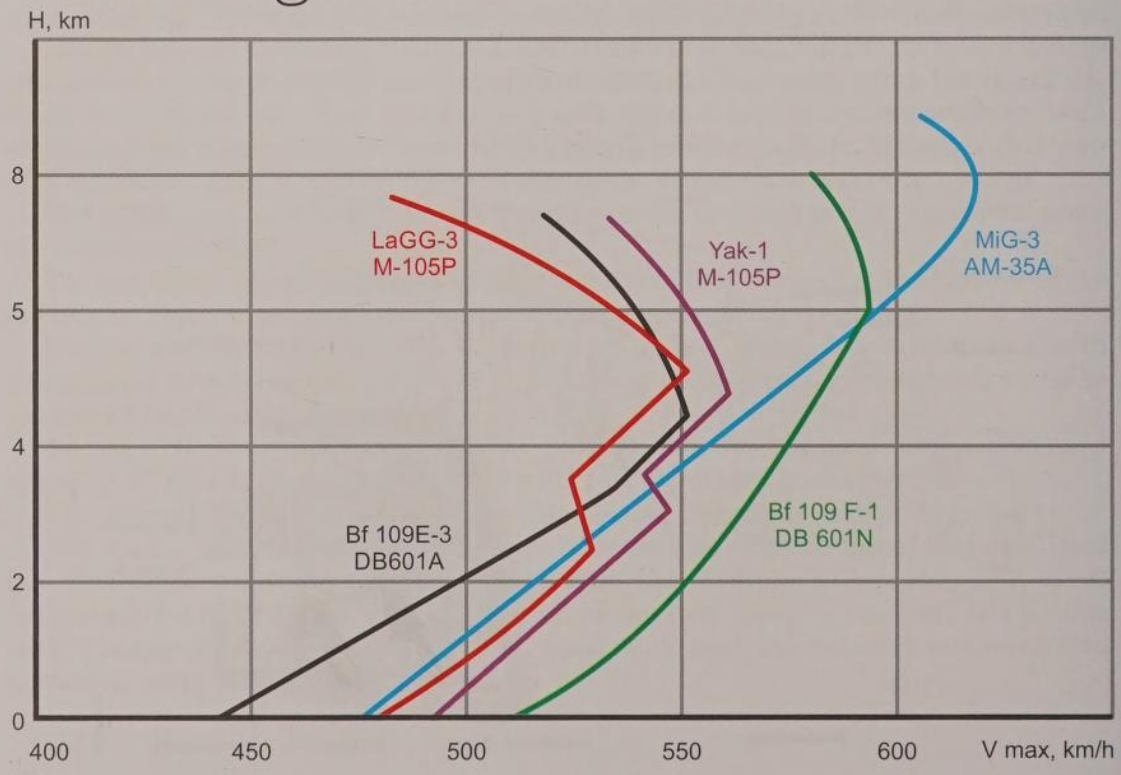


Bf 109E radio system, drawing published in Technical manual.

Bf 109 E Specifications

Version	E-1	E-3	E-4	E-7
Wing Span [mm]	9,900	9,900	9,900	9,900
Lenght [mm]	8,760	8,760	8,800	8,850
Height [mm]	2,450	2,450	2,500	2,500
Wing area [m2]	16.35	16.35	16.35	16.35
Empty weight [kg]	2,010	2,060	2,037	
Gross weight [kg]	2,505	2,610	2,568	
Engine	DB 601 A	DB 601 A	DB 601 A	DB 601 N
Armament	4 x MG 17	2 x MG 17 2 x MG FF	2 x MG 17 2 x MG FF/M	2 x MG 17 2 x MG FF/M
Ceiling [m]	8,150	10,300	11,000	11,125
Max. speed [km/h] at:				
See level		460		
2,000 m		500		
3,750 m			575	578
4,000 m	470	570		
5,000 m	555			
7,000		550		
Max. range [km]	Ca. 600	660	665	665

Speed comparison, according to Russian tests



Bf 109E Construction Numbers (W.Nr.)

W.Nr. (construction number)	Version	Number produced	Factory	Remarks
666 – 994	E-3	329	Erla	812 E-3 total (some converted to E-3/N)
1074 – 1574	E-3	501	Erla	
1575 – 1659	E-4	85	Erla	
1781 – 1790	E-0	10	BFW	
1791 – 1804	E-1, E-3	14	BFW	2 E-1 followed by 12 E-3
1927 – 1954	E-3	28	BFW	(some converted to E-3/N)
1955 – 1979	E-3	28	Mtt	
1980 – 2063	E-4, E-4/B	84	Erla	14 E-4, 70 E-4/B
2159 – 2178	E-3a	20	Mtt	For Switzerland
2189 – 2198	E-3a	10	Mtt	For Switzerland
2316 – 2335	E-3a	20*	Mtt	For Yugoslavia and Romania
2346 – 2364	E-3, E-3a	19	Mtt	E-3a for Switzerland (14) and Yugoslavia
2373 – 2392	E-3, E-3a	20	Mtt	E-3a for Switzerland (12)
2403 – 2442	E-3, E-3a	40	Mtt	E-3a for Switzerland (24), Yugoslavia and Romania
2479 – 2513	E-3, E-3a	33	Mtt	E-3a for Yugoslavia and Romania
2622 – 2649	E-3, E-3a	28	Mtt	E-3a for Romania
2657 – 2696	E-1, E-5	40	Arado	
2723 – 2788	E-1, E-9	65	Arado	Except 2724 (D-1) – many sources stated as E-4
2789 – 2806	E-4	18	Mtt	(some converted to E-4/N)
2941 – 2964	E-1	24	Arado	
3171 – 3299	E-1	129	Fieseler	
3300 – 3379	E-1	80	AGO	
3380 – 3664	E-1	285	Arado	(some converted to E-4/N)
3701 – 3764	E-4, E-4/B, E-4/B N	64	Mtt	14 E-4, 35 E-4/B, 15 E-4/B N
3765 – 3827	E-7	63	Mtt	
3854 – 3919	E-1	66	Arado	(some sources state as E-5)
4001 – 4090	E-1	90	FW	
4091 – 4222	E-4/B, E-7, E-7/N	132	Erla	26 E-4/B, 106 E-7 and E-7/N
4801 – 4975	E-1/B, E-6/N, E-7/N, E-8	175	Arado	Including 49 E-1/B, 9 E-6/N, 33 (?) E-7, 46 E-7/N, 38 E-8
5001 – 5259	E-3	249	WNF	
5260 – 5300	E-4	41	WNF	
5326 – 5400	E-4	75	WNF	
5559 – 5600	E-4, E-4/B	42	WNF/Arado	3 E-4 (WNF), 39 E-4/B (Arado)
5791 – 5823	E-4/B	32	WNF	
5891 – 5919	E-4/B, E-4/N	29	WNF	9 E-4/B, 20 E-4/N
5920 – 5985	E-7, E-7/N, E-7/Z	66	WNF	66 E-7 including 3 converted to E-7/N and 7 as E-7/Z
6001 – 6318	E-1	318	Fieseler	
6319 – 6401	E-1/B, E-8	83	Fieseler	61 E-1/B, 22 E-8
6402 – 6500	E-7, E-7/N	99	Fieseler	
6501 – 6523	E-7	23	WNF	
7661 – 7696	E-7, E-7/N, E-7/Z	36	Fieseler	

Abbreviations of plants: Erla = Erla Maschinenwerk (Leipzig). BFW = Bayerische Flugzeugwerke (Augsburg). Mtt = Messerschmitt AG (Regensburg). Arado = Arado Werke (Warnemunde). Fieseler = Fieseler-Werke (Kassel). AGO = AGO Flugzeugwerke (Oschersleben). FW = Focke-Wulf Fluqzeuqbau (Bremen). WNF = Wiener-Neustädter Fluqzeugwerke (Wiener Neustadt).

Foreign Emils

Bulgaria

Messerschmitt Bf 109E *Strela'* in *Bulgarian Voennov"zdushni Sili* (Bulgarian Air Force) – *by Dénes Bernád*

In early March 1940, a Bulgarian delegation, led by Lieutenant General Rusi H. Rusev, Inspector General of Armaments, visited Messerschmitt AG's headquarters in Augsburg. The Bulgarians' aim was to secure the purchase of the Bf 109, enough to equip a fighter squadron. An agreement was signed on 6 April 1940, which stipulated the sale of ten Bf 109E-3 fighters.

The ten commissioned aircraft were brand new ones, built at Wiener Neustädter Flugzeugwerke (WNF) in Wiener Neustadt, Austria, and delivered by train from there on 17 April 1940. Even before the Bf 109E entered service, the type officially received a typical Bulgarian code name *Strela*, or Arrow. The Bf 109E was assigned the military register number 7047 (i.e., the fourth fighter aircraft type in VNVV service). The VNVV serial numbers ran from 1 to 10, and coincided with the last digit of the original German construction number (W.Nr. 5221 to 5230).

A comprehensive order of battle of VNVV, dated 1 July 1940, does not list the Bf 109Es as probably they were not combat ready yet. When they eventually entered active service in August, the ten Bf 109Es were assigned to 682. *Yato* of 1/6. *Iztrebitelen Orlyak*, based at Marno-Pole airfield, near Karlovo. When 692. *Yato* was formed in October, the ten '109s were assigned in equal numbers to both squadrons.

After the signing of the Tripartite Pact on 1 March 1941, which allied Bulgaria to the resurgent Germany, Italy and Japan, Berlin was more eager to export weapons to its newest ally, knowing they would be put to the advantage of the Axis' cause. One of the first deals struck was the delivery of nine additional Bf 109Es, which would complement the existing ten 'Emils'. The contract, calling for the sale of nine Bf 109E-3as, was signed on 17 July 1941, and included additional armour attached to the pilot's seat. They were manufactured by different factories in different timeframes, and had suffered various degree of damage prior to general overhaul and upgrade to E-3a standard.

Bulgarian Bf 109E-3a. Note spinner in E-7 standard. (Dénes Bernád coll.)

Bulgarian Bf 109E-3, 'White 7'. (Dénes Bernád coll.)

The nine refurbished aircraft arrived in Bulgaria on 23 August 1941. After the fighters were declared fit for service, they were assigned to the same main unit, the independent 6th *Iztrebitelen Polk* (Fighter Regiment), headquartered at Karlovo airfield. They received Bulgarian serial numbers in the 11-19 range.

An interesting technical detail was revealed to the author by retired veteran flying instructor and test pilot Petâr Manolev – dean of the surviving wartime Bulgarian fighter pilots in the 2000s – during an interview with the Author in Sofia, on 22 May 2004. Mr. Manolev recalled that at the end of April 1943, bomb racks were experimentally fitted to an 'Emil', suitable for 50 kg bombs. The bombs could be released electrically. Each *yato* received 10 such bomb racks. However, the project to transform the 'Emils' into fighter bombers did not go beyond experiments and test flights.

Hungary

Messerschmitt Bf 109E in *Magyar Királyi Honvéd Légierő* (MKHL – Royal Hungarian Air Force). – *by Dénes Bernád*

The first '109 'Emil' handed over to the Hungarians was a demonstrator aircraft, in 1943. It was used by the MWG Plant in Győr to accustom its employees to the Bf 109's technology for the upcoming local series production of the type. Also in 1943, several *Luftwaffe* Bf 109Es arrived in Hungary as trainers for Hungarian and German pilots to be transferred to front line units equipped with the Bf109 Fs and Gs.

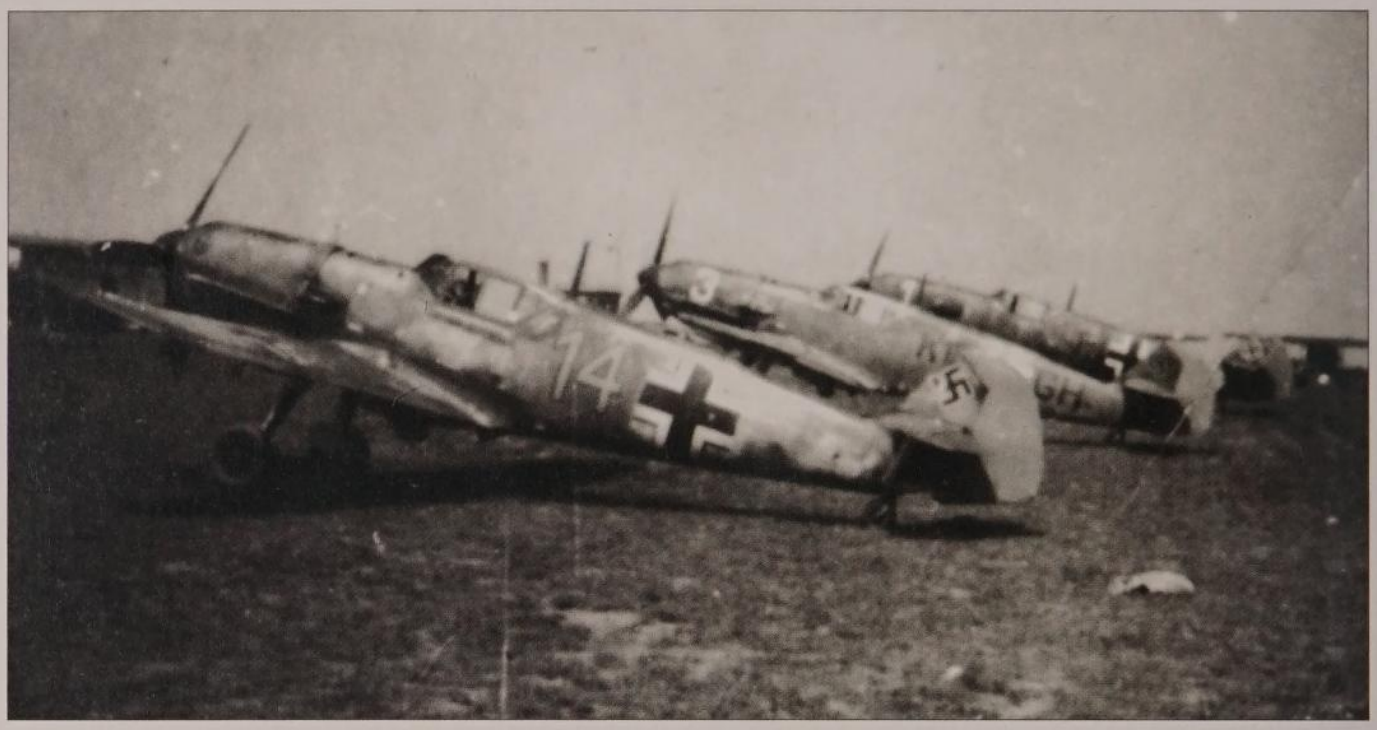
The 'Emils' flown by Hungarian student pilots remained German property, thus they kept their *Luftwaffe* markings. In total, about 40 Bf 109E-3s, E-4s and E-7s operated in Hungary. Several Bf 109Es were also probably used by the 101/6. *Kölyök* (Kid) *vadászszázad* (Fighter Squadron), the training unit of the famous 101. *Puma vadászezred* (Fighter Regiment). The only time 'Emils' are depicted wearing MKHL markings is in the Hungarian wartime aviation movie, *Magyar Sasok* (Hungarian Eagles), shot in the Autumn of 1943.

Japan

German sources stated that Japan ordered 2 Bf 109E-3a in 1940, along with 3 spare DB 601a engines.

Also, in 1941/2 two or five Bf 109Es were sent to Japan for evaluation. Aircraft were without armament.

They were used exclusively for comparison tests against Japanese designs.



Bf 109Es used as school aircraft at Börgönd. The 'Yellow 14' still awaiting its original four-letter radio code. (György Punka coll.)

This Bf 109E had formerly flown with 1./SchG 101 in January 1943. (Dénes Bernád coll.)

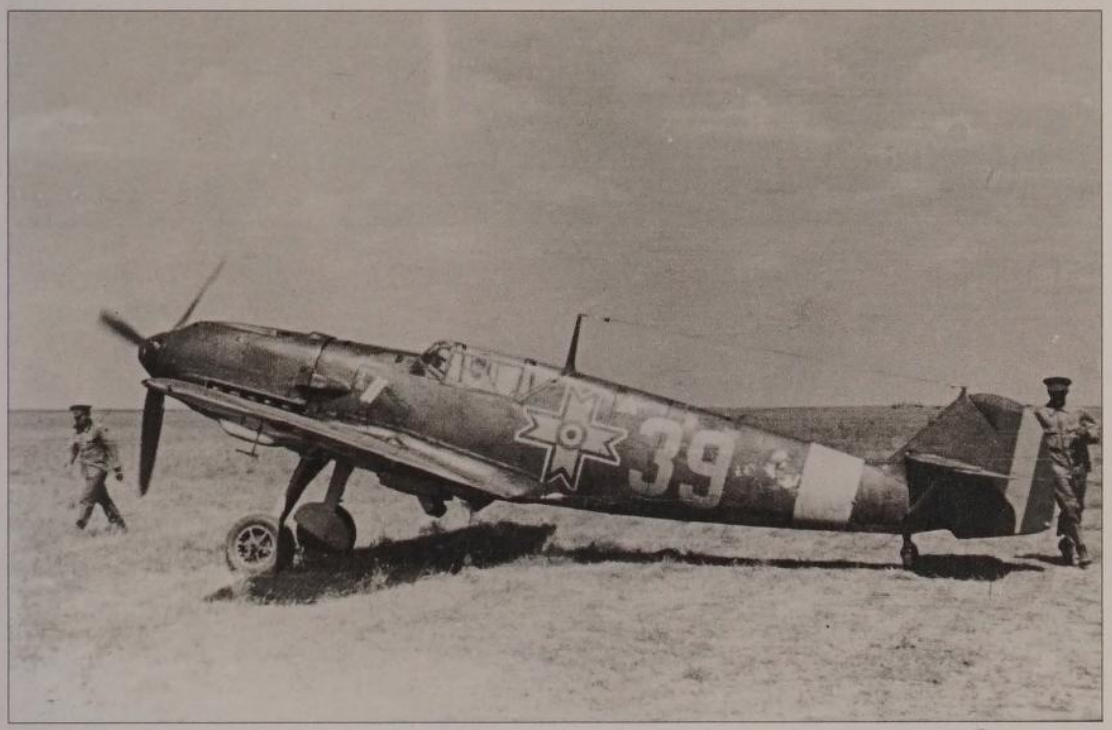
One of the Bf 109E-3s sent to Japan seen with Japanese pilots and mechanics.

Romania

In December 1939, *Aeronautica Regală Română* (Royal Romanian Air Force) placed an order for 50 Bf 109E fighters with Bayerische Flugzeugwerke. The first eleven aircraft (E-3a) arrived during the spring of 1940 and the remaining 39 came a year later. Aircraft (different versions) delivered in 1941 were German ones withdrawn from different school units and overhauled and converted to E-7 standard by Amme-Luther-Seck GmbH.

Based on Pipera-Bucharest airfield, the newly formed *Grupul 7 Vânătoare* (7th Fighter Group), received the German fighters. The Romanian Bf 109E fighters took part in Operation Barbarossa from the very beginning of operations, when they escorted the bombers attacking Soviet airfields and performed strafing attacks against ground targets.

After August 1944, the obsolete Bf 109Es did not see any further action and were phased out in 1946.



Bf 109E-3a, 'Yellow 39' of Escadrila *58,* Grupul *7* Vânătoare, *Nikolaev, Ukraine, November 1942. (Dénes Bernád coll.)*

Bf 109E-3a, W.Nr. 2486, 'Yellow 9' of Escadrila *57,* Grupul *7* Vânătoare, *Karpovka-Stalingrad, November 1942. Usually flown by* Lt. Av. *Ion Di Cesare. (Dénes Bernád coll.)*

Bf 109E-3, 'Yellow 37' Grupul 7 Vânătoare, Pipera, Romania, 1941.

Spain

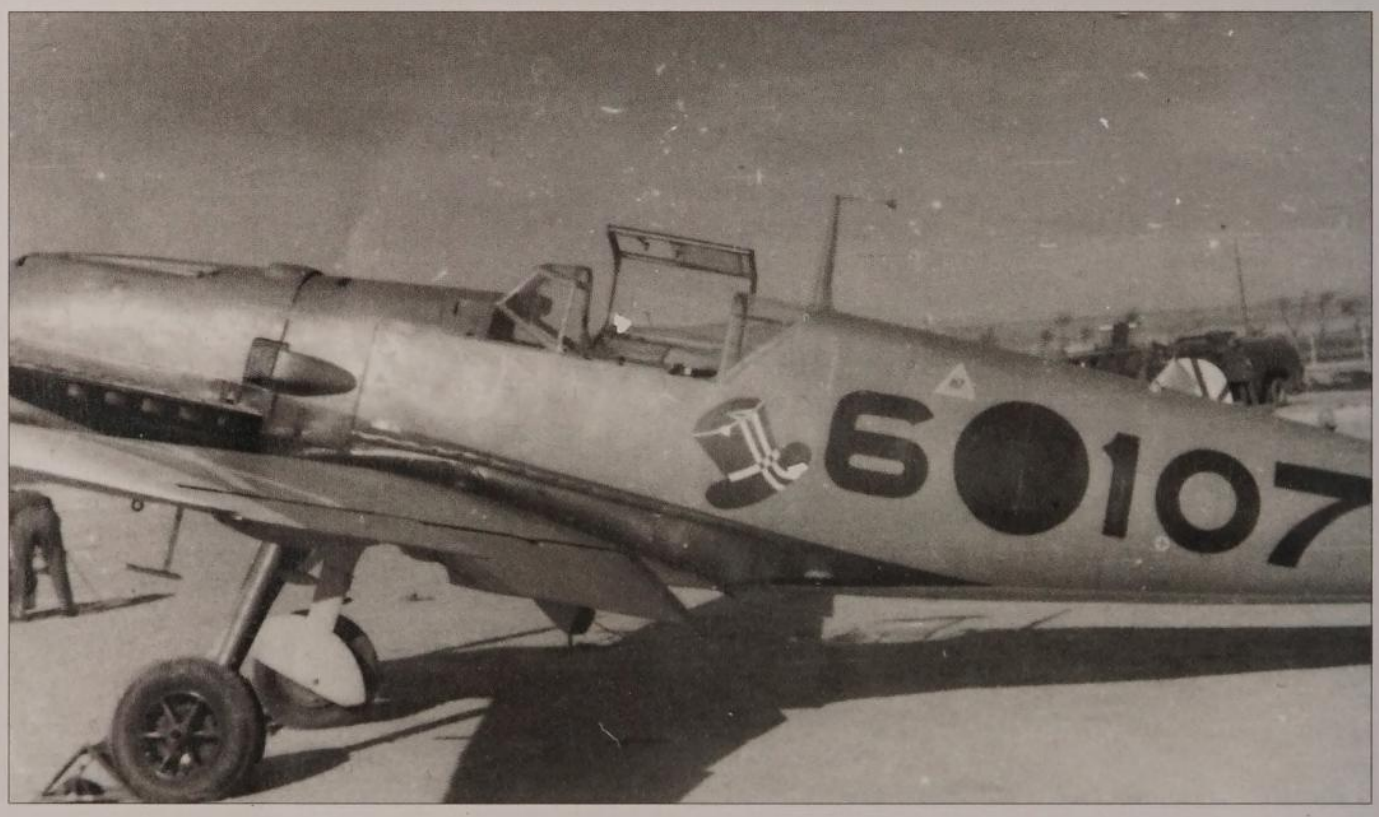
Legion Condor used about 44 Bf 109s of E-1 and E-3 versions.

On leaving Spain, the Germans passed their aircraft to their allies, including several Bf 109Es which served in the Spanish Air Force until the late '40s.

Spanish volunteers of *Escuadrilla Azul* (Blue Squadron) on the Eastern Front operated Bf 109E-4, E-7, E-7/B, F-2, F-4 as a part of JG 27 under the command of *Luftflotte* 2, until April 1943.

One Bf 109E-1 (6-119), later served in *Grupo* (Air Wing) 6-G-6 and finally 25 *Grupo*, 23 *Regimento* (Air Regiment) was subsequently used by Hispano Aviacion and Instituto Nacional de Técnica Aeronáutica as a test bed for the Hispano-Suiza 12Z-80 engine.

Bf 109E-4, 6-107 of 2.J/88, Spain 1939, Legion Condor.



One of the Legion Condor Bf 109E-3s during engine maintenance. (via José Fernandez)

Three photos of the Bf 109Es used by Spanish pilots of Escuadrilla Azul *on the Eastern Front, November 1941. (all via José Fernandez)*

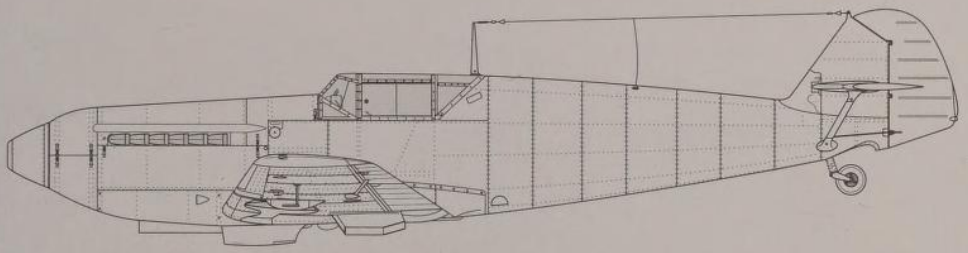
Another Bf 109E used by Spanish pilots of Escuadrilla Azul.

Bf 109E-3, 6-110 *with Spanish markings on the wings. Photo was taken in 1943.*

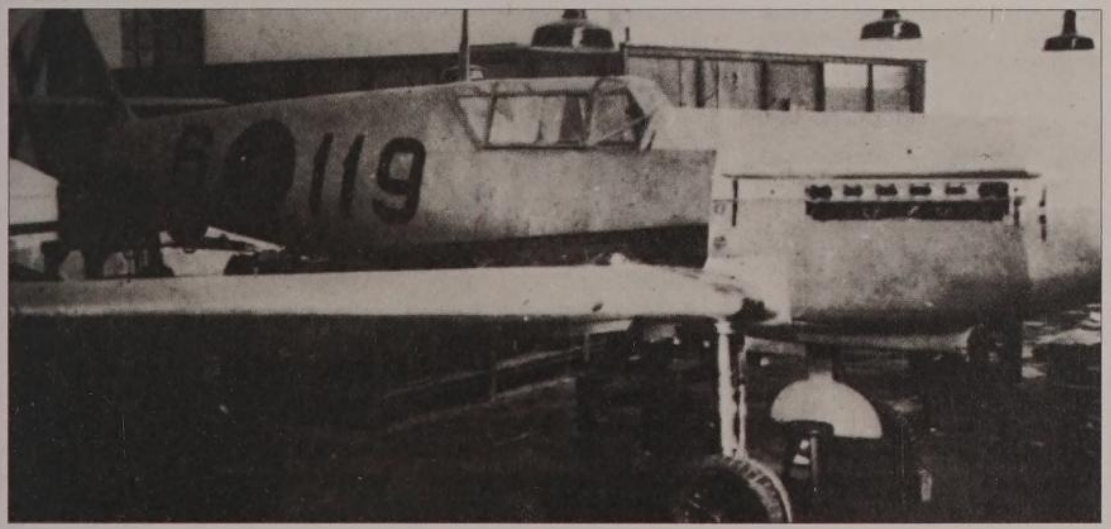
Bf 109E-3, 6-126 *in Spanish service, 1942.*

(all via José Fernandez)

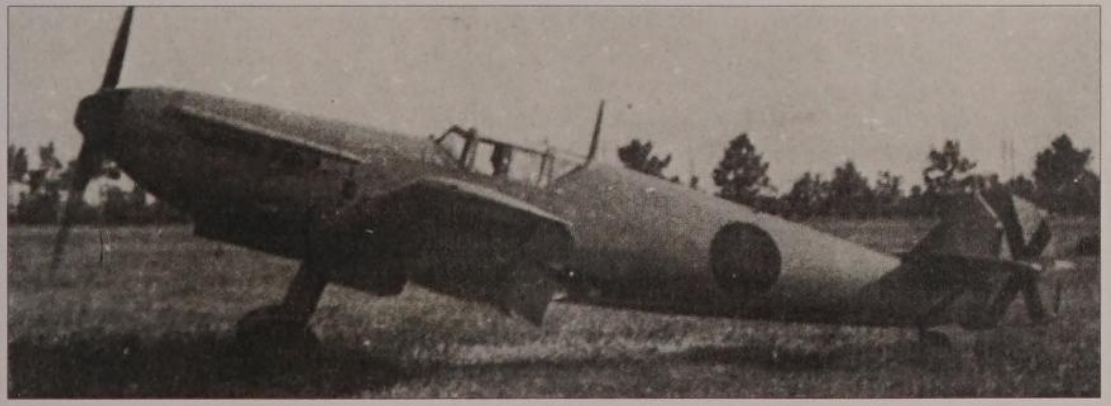
Crashed Spanish Bf 109E-3, s/n C.4E-127, 23-43, with Spanish markings in six positions. Photo was taken in 1954.



Bf 109E-3 with Hispano-Suiza 12Z-89 engine, used for the tests. 1/72 scale.



Two photos of the Bf 109E-3, formerly Legion Condor 6-119 of Jagdgruppe *88 and later serving with* Grupo *6-G-6 and finally at 25* Grupo *of 25* Regimento. *Aircraft was used as a test-bed for Hispano-Suiza 12Z-89 engine.*



Switzerland

In early 1939, Switzerland signed an order for 56 Bf 109E-3a.

The first aircraft were delivered by the end of 1939, but without armament and radio gear, and were not immediately ready for operational use.

Another 24 were delivered in 1940 under the next order signed in April 1940.

Eight more Emils were built in the Dogflug factory in Switzerland. (see previous section)

The last Bf 109Es were written off in October 1947.

Swiss Bf 109E-3a, J-316, before delivery to Switzerland. (Dénes Bernád coll.)

Slovakia

Bf 109Es were used by 13. *Staffel* (*slowakisches*) *Jagdgeschwader* 52 (13.(slovak)/JG 52) on the Eastern Front between 1941 and 1943.

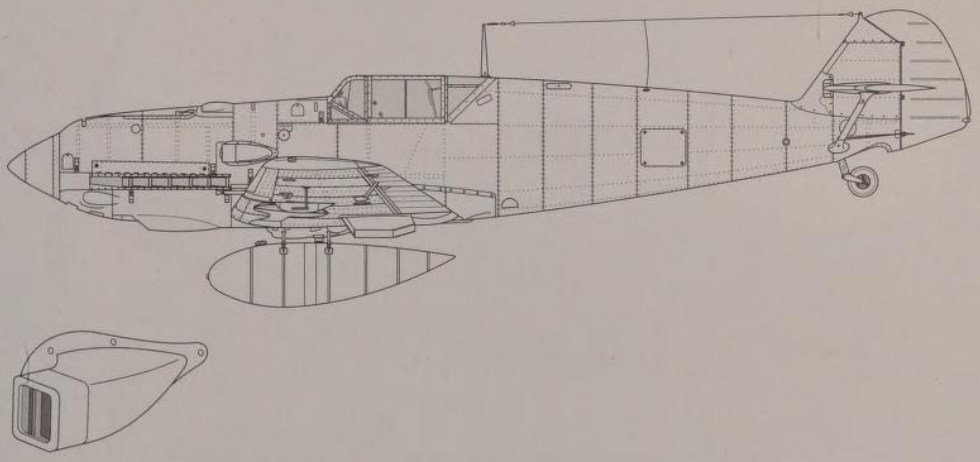
On 25 February 1942, Slovak pilots were sent to Karup-Grøve airfield in Denmark for conversion training to the Bf 109. Each Slovak pilot had about 20 flying hours with the Bf 109.

The Slovak MNO and German RLM had made an agreement to set up a committee supposed to make technical checks in Grøve on 12 Messerschmitt Bf 109E-7 aircraft that were being offered to Slovakia. In fact, only five of the aircraft were the required Bf 109E-7 version, the remaining six being older Bf 109E-1, E-3 and E-4s. Following the end of the course only nine of the twelve Emils accepted were prepared for flight to Slovakia: two of the Bf 109E-3 model (W.Nr. 972 and 993), four Bf 109E-4s and three Bf 109E-7s (W.Nr. 5015, 5244 and 6474).

Later, from October 1942 to March 1943, more Bf 109Es were supplied to Slovakia, but the final number of Slovak Emils (E-1/B, E-3, E-4, E-7 and E-7/Trop) is not certain – sources differ between 19, 21 or 29 aircraft.

Bf 109E-1, W.Nr. 2945, 'White 2' of 13.(slovak)/ JG 52. October 1942. (via M. Krajci)

Bf 109E-7 used in Flying School at Trenčianské Biskupice airfield, 1943. Note different engine air intake as used on E-7 variant built by Fieseler factory, (similar to the air intake used on Bf 109 T). (via P. Šumichrast)



Bf 109E-7 built by Fieseler factory, with different style engine air intake. 1/72 scale.

Yugoslavia

Jugoslovensko Kraljevsko Ratno Vazduhoplovstvo (JKRV – Royal Yugoslav Air Force)

The Yugoslavian government signed an agreement with Germany on 5 April 1939 to buy 50 Bf 109E-3a and 25 additional DB 601Aa engines. An additional agreement for another 50 Emils and 25 engines was signed in June. Aircraft were delivered without armament in the wings, so Yugoslavia had to mount Oerlikon 20 mm cannon.

All Bf 109E-3as were supposed to be delivered during 1940, but only 73 were actually delivered by the end of April 1940.

At the outbreak of the German-Yugoslav war only 61 were operational. They achieved some successes against *Luftwaffe* aircraft, but all Yugoslav Messerschmitt Bf 109E-3as were destroyed, or captured during the invasion.

Note: Comparison between German and Yugoslav opponents.

If we want to compare the Yugoslav Bf 109E-3a and the Bf 109E-3, E-4 and E-7 of the *Luftwaffe*, it must be admitted that German aircraft were better equipped and armed. Some of the Bf 109s were still of the E-1 version, but they were generally upgraded to E-4 or E-7.

The *Luftwaffe* Bf 109Es were better equipped and a little faster. They had an armoured canopy and their weapons were supplied with various types of ammunition, whereas the weapons of the Yugoslav Bf 109s only used perforating (machine-gun) and explosive (cannon) cartridges.

The main advantage of the Germans lay in their superior training, which provided them with complete control of their machines. Most the Yugoslav pilots had only a few hours flying on the Bf 109, and no experience of air combat. Some, until the outbreak of the war, had not even fired their guns!

During the Battle of the April War, the Yugoslav Air Force lost all its Bf 109s. 23 were lost directly to German Bf 109Es. No German Bf 109E was lost against a Yugoslav one.

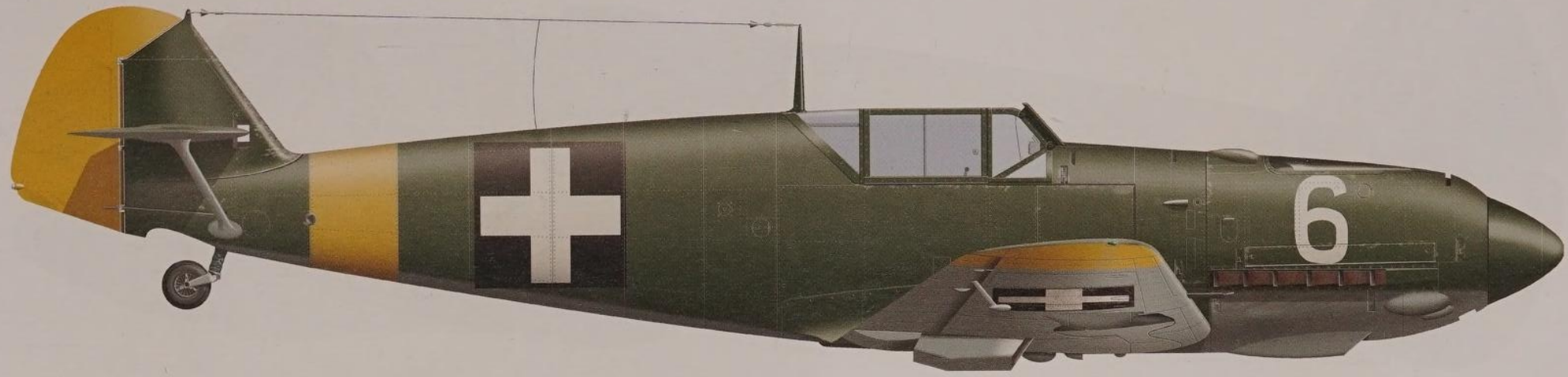
USSR

In 1940, the Germans sold to the Soviet Union several examples of their military aircraft, including the Bf 109E. There were probably three or five Emils of the E-3a version. These aircraft were extensively tested by Soviet engineers.

Bf 109E-3a, L-15, built for Yugoslavia, being examined by a Hungarian flying officer, after capture. (Dénes Bernád coll.)

Above: *Bf 109E-3a, 'Strela', W.Nr. 7047, 'White 14'. 672.* Iztrebitelen Yato, *pilot* Podporuchik *Mikhail G. Grigorov, Petrovats airfield, October 1943. Aircraft RLM 71 uppersurfaces and RLM 65 undersurfaces. Spinner, engine cowling, rudder and fuselage stripe in Yellow. Note E-7 type spinner and late style canopy.*

Below: *Bf 109E-7, 'White 6', 3.* vadászkiképző-század, *Börgönd, late 1943. Two-tone camouflage colours and Hungarian markings applied specially for the* 'Magyar sasok' *(Hungarian Eagles) aviation-themed movie, released in May 1944. Camouflage colours (probable, but unconfirmed): Dark Green (G.1103) over Light Blue (G.1101) Cellaetern paints by Krayer & Co., Budapest, Hungary. Yellow Axis identification markings possibly C.54 type Krayer aircraft finishing paint. Note additional windscreen armour.*



Above: *Bf 109E-3, 'Yellow 23' of* Escadrila *57,* Grupul *7* Vânătoare. *Personal aircraft of Adj. Av. Ştefan Greceanu. RLM 71 uppersurfaces with RLM 65 undersurfaces. Engine cowling, lower wing tips and fuselage band in Yellow.*

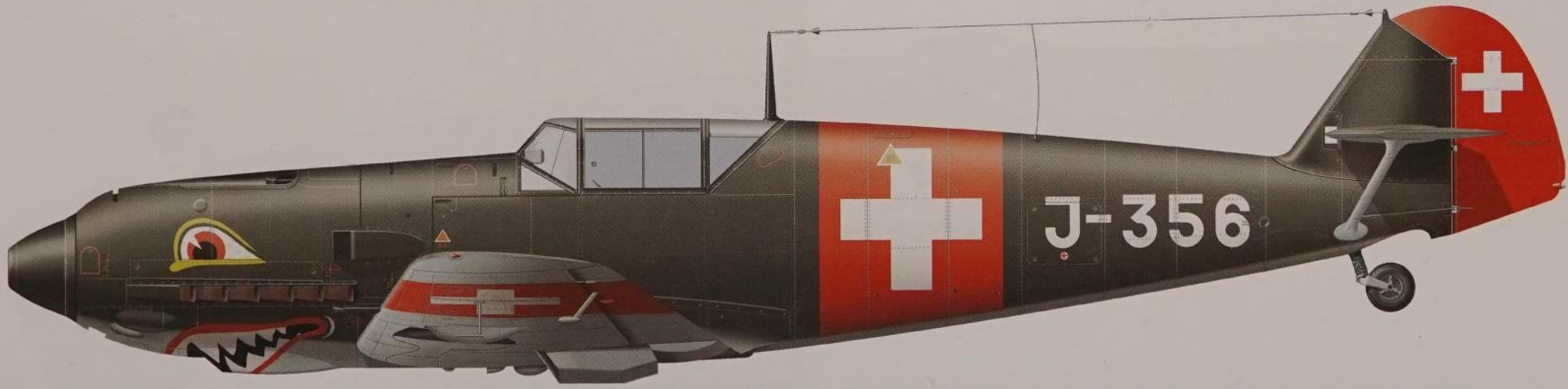
Below: *Bf 109E-3, 'Yellow 47' of* Escadrila *58,* Grupul *7* Vânătoare, *Nikolaev, Ukraine, November 1942. RLM 71 uppersurfaces with RLM 65 undersurfaces. Engine cowling, lower wing tips and fuselage band in Yellow. Note additional windscreen armour.*

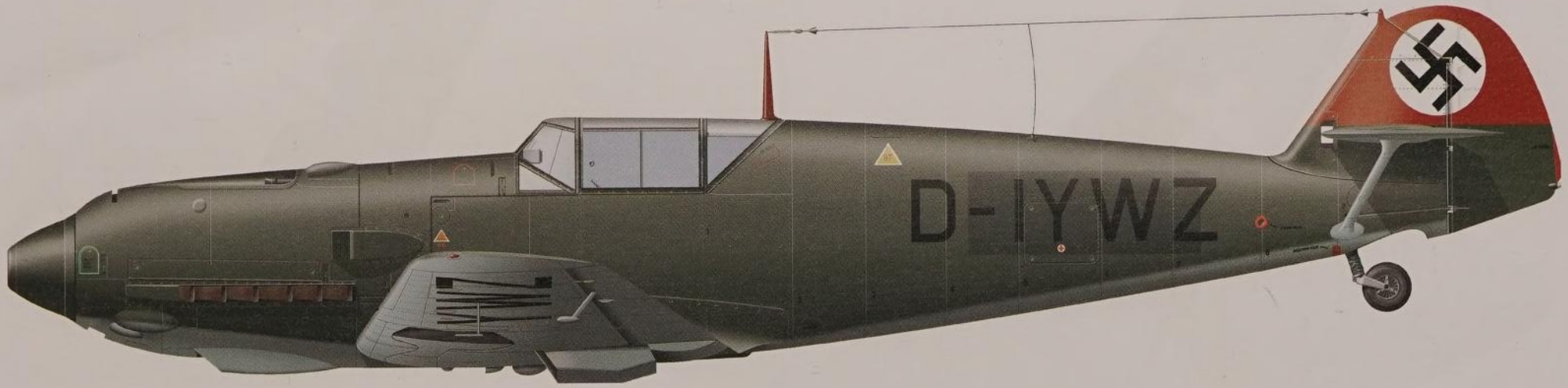
Above: *Bf 109E-1 or converted E-7, W.Nr. 2945, 'White 2-2'. Pieštany airfield, July 1942. Aircraft still in* Luftwaffe *camouflage (with swastika on the fin) of RLM 74 and RLM 75 uppersurfaces and RLM 76 undersurfaces. Aircraft mottled in RLM 70 and RLM 02. Yellow wing tips and fuselage band. Note E-7 style spinner.*

Below: *The same aircraft but as it was photographed in October 1942. Note overpainted swastika and bigger '2' probably with RLM 70. Aircraft was flown by* stot. *Ondrej Dumbala.*

Above: Bf 109E-3, 23-43 of Spanish Air Force, 25 Grupo, *23* Regimento, *early 1950s. Aircraft silver overall.*

Below and opposite page: *Bf 109E-3a, J-356 of* Fliegerkompanie *15,* Flugwaffe *(Swiss Air Force), Thaune, 1940. Aircraft RLM 70 uppersurfaces and RLM 65 undersurfaces.*

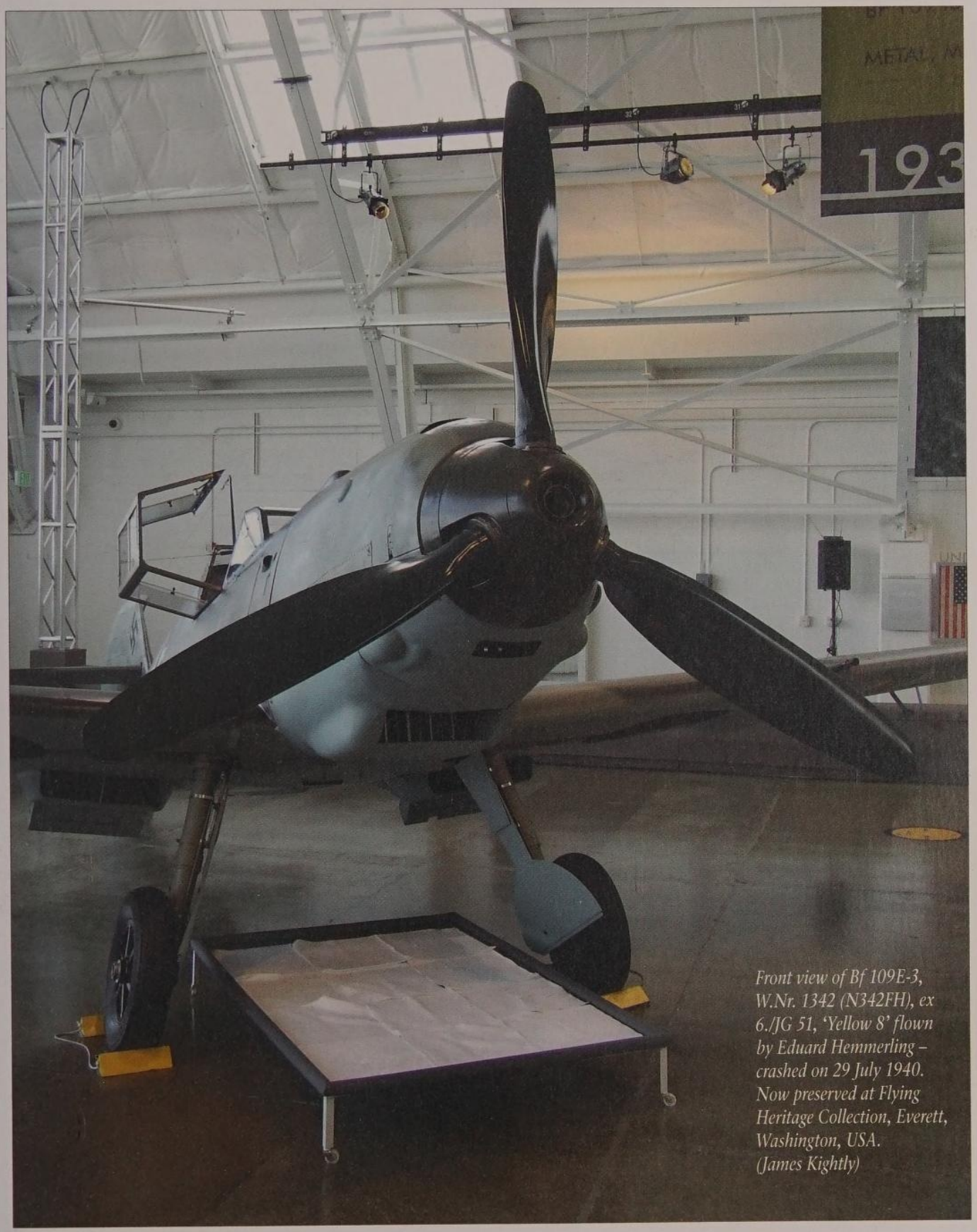




Above: Bf 109E-3a, D-IYWZ, one of the very few Bf 109Es in civilian markings. Demonstration aircraft. Aircraft RLM 71 uppersurfaces and RLM 65 undersurfaces.

Below: Bf 109E-3a, s/n 2502, L-2. Delivery markings for Yugoslavia, 1940. Aircraft RLM 71 uppersurfaces and RLM 65 undersurfaces.

In Detail
General view



Front view of Bf 109E-3, W.Nr. 1342 (N342FH), ex 6./JG 51, 'Yellow 8' flown by Eduard Hemmerling – crashed on 29 July 1940. Now preserved at Flying Heritage Collection, Everett, Washington, USA. (James Kightly)

Bf 109E-3a, W.Nr. 2242, ex-Swiss AF J-355. Aircraft preserved at Swiss Air Force Museum, Dübendorf. (David Weiss)

Bf 109E-3, W.Nr. 1190, (ex Bf 109E-4/N), 4./JG 26, 'White 4'. Imperial War Museum Duxford.

Bf 109E-3, W.Nr. 4101, ex GH+DX, ex 6./JG 52 'Yellow 8', ex 2./JG51 'Black 12', ex RAF DG200, ex No. 1426 Flight RAF (the 'Rafwaffe'), used in Battle of Britain film, 'Black 12'. RAF Museum, Hendon. (Bartłomiej Belcarz)

***Above**: Port side of the Swiss Bf 109E-3a. (David Weiss)*

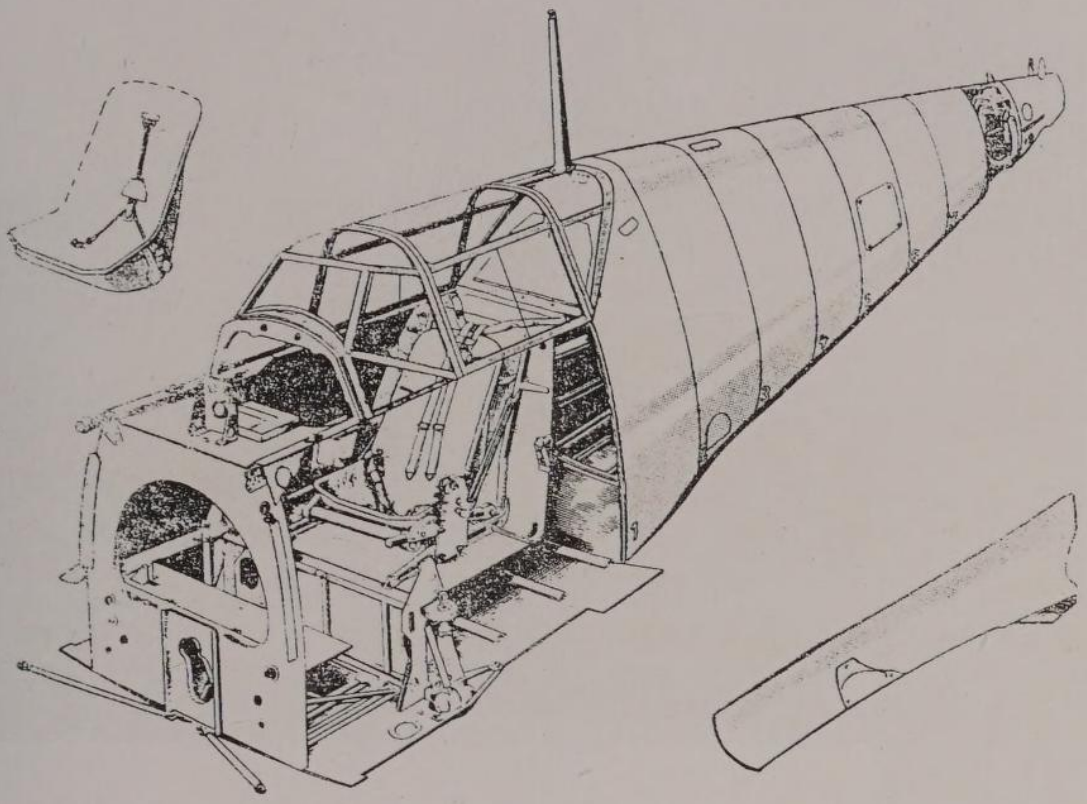
***Right**: Port, central side of the Bf 109E-3. Note open fuel tank filler cap.*

***Below**: Another photo of the fuselage, port side. Bf 109E-3 during refuelling.*

Crashed Bf 109E-4 with wings removed, showing fuselage details.

Port side of the Bf 109E-3, preserved at Flying Heritage Collection. Everett, WA, USA. (Fotios Rouch)

Bf 109E-3, 'Black 1' of III./JG 26. Port, rear side of the fuselage. Note antennae mount and 'inlet'.

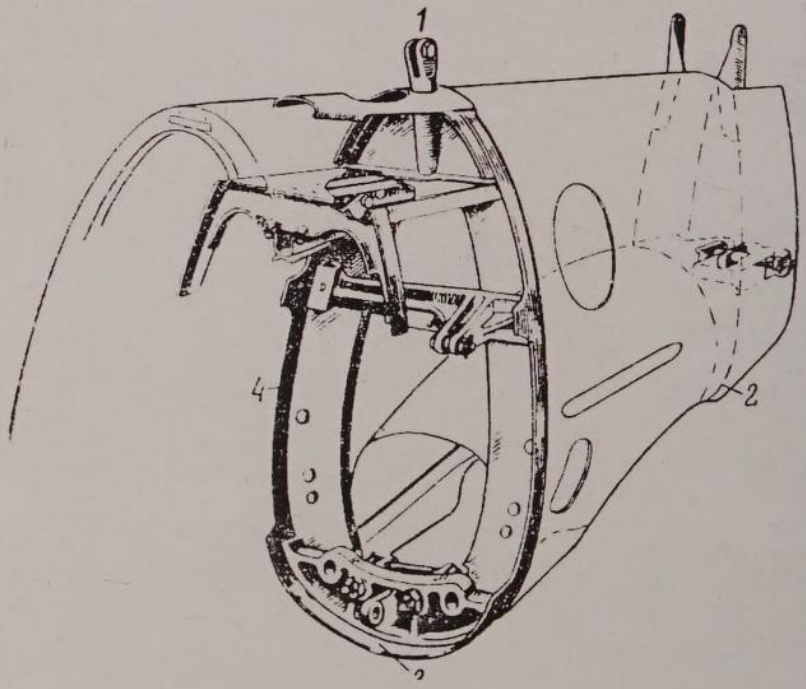


Fuselage construction details. Note separate drawing of the wing-fuselage fairing. (Drawing from Russian Bf 109E Technical Description)

Another shot of the Bf 109E-3, port side fuselage. This aircraft is in flyable condition. (James Kightly)

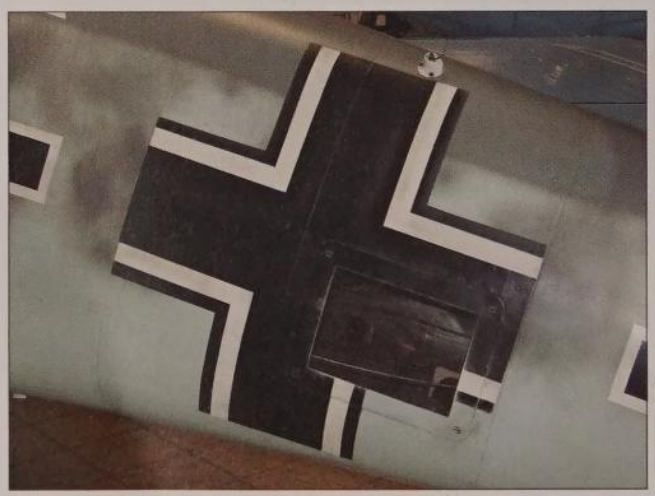
Details of the fuselage-wing fairing. Bf 109E-3 of JG 26.

***Below:** Antenna mast mount on the fuselage top, just behind the canopy.*



***Right:** Fuselage construction details showing fuselage frame behind the cockpit. (Drawing from the Russian Technical Description)*

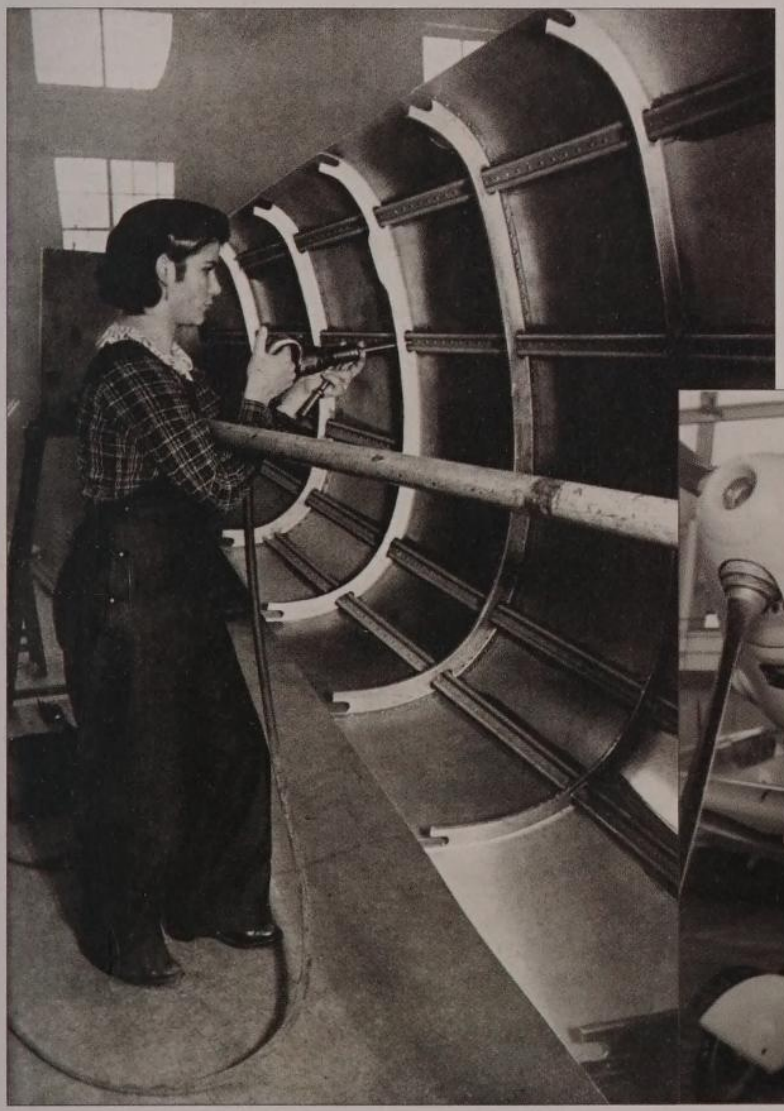
***Bottom:** Two photos of the rear part of the fuselage. (both James Kightly)*



Top: Bf 109E-7, W.Nr. 3523 (rebuilt from E-1). Personal aircraft of Wulf-Dietrich Widowitz of JG 5, was shot down by Soviet Hurricane. Aircraft was recovered from the lake in 2003. Shown in the picture after recovery before final restoration. Planes of Fame, Chino, CA, USA.

Left: Bf 109E fuselage construction.

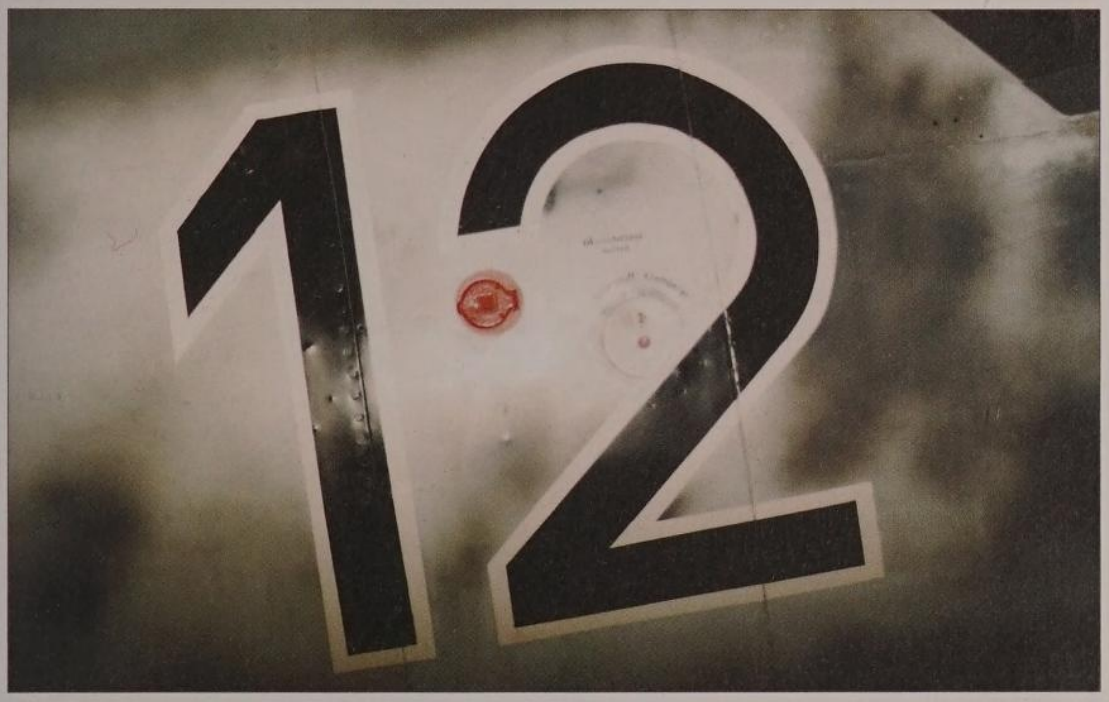
Below: Bf 109E-4 front fuselage. Note engine cowling details.



Above: Two photos of the Bf 109E fuselage, top front (left photo) and rear top (right photo).

Below: Starboard side of the Bf 109E-7 fuselage. Note missing part of the wing-fuselage fairing and many panel covers. (James Kightly)

Starboard side, starter crank fairing. (David Weiss)

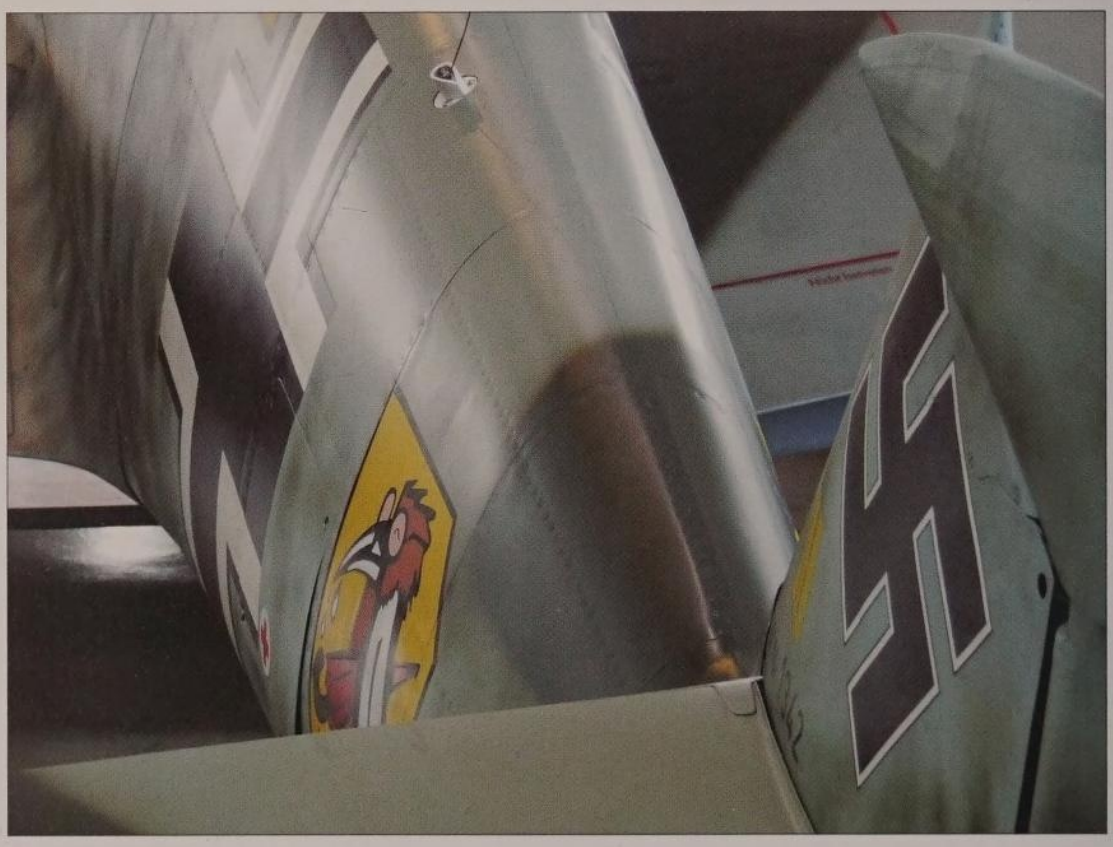


Starboard side. Light Blue and White oxygen filler hatch and red power-supply socket.

Port side: Foot step cover. Note also wing-fuselage fairing. Details of the metal strip strengthening the fairing and mounting screws are clearly visible.

Bf 109E-7/B/trop, S9+GR of 7./ZG1 abandoned Martuba, 1942.

Rear part of the fuselage. Oval fuselage shape is clearly visible. (James Kightly)



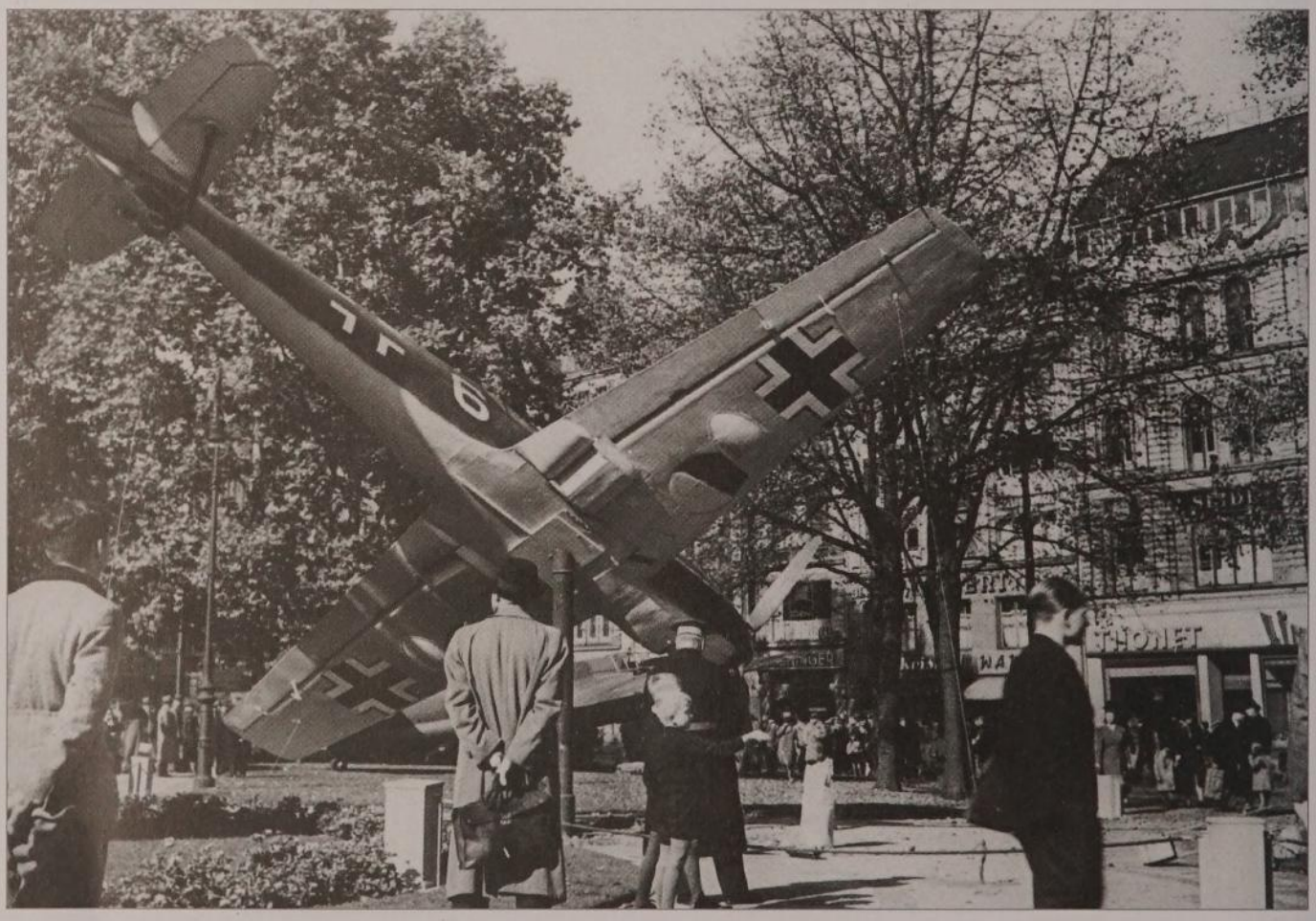
Upper part of the fuselage, just in front of the cockpit.

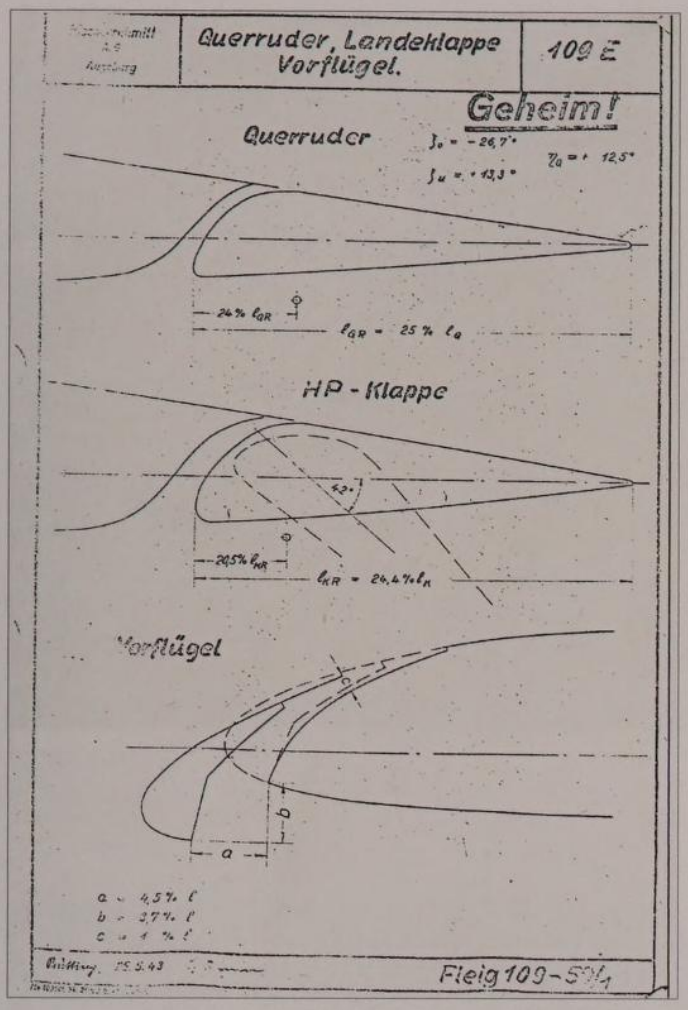
Antenna mast, starboard side.

Port side of the Bf 109E-7.

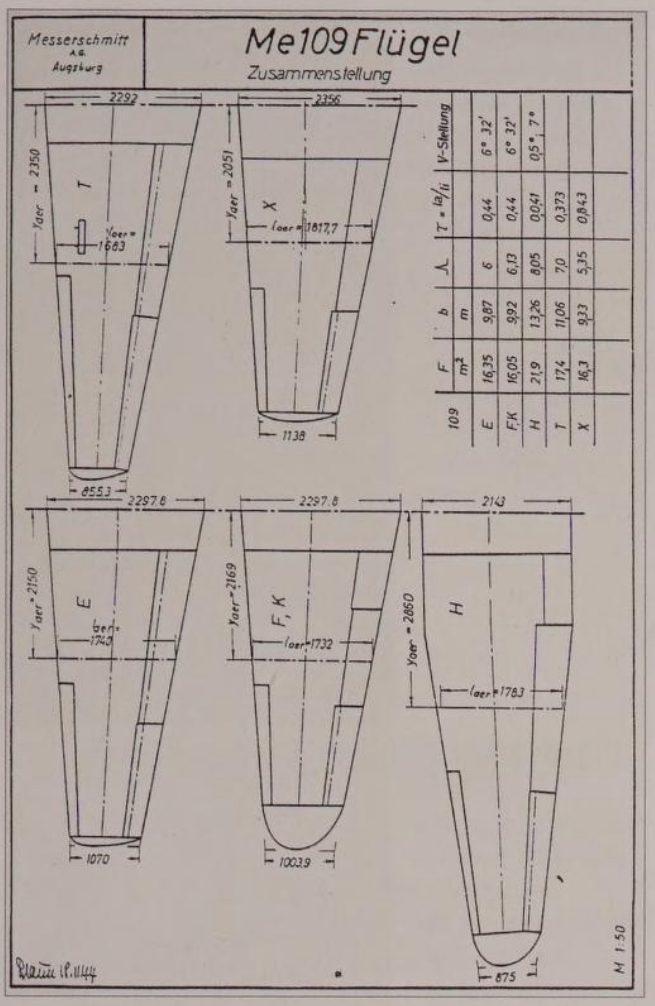
Wing

Two photos of the Bf 109E-3 displayed during the Military Exhibition in Berlin, early autumn 1940. Wings details, upper and lower surfaces are well shown. (via Robert Michulec)





Factory drawing showing profiles of the aileron (top), landing flap (middle) and slot (bottom).



Factory drawing showing the wings of the different Bf 109 versions

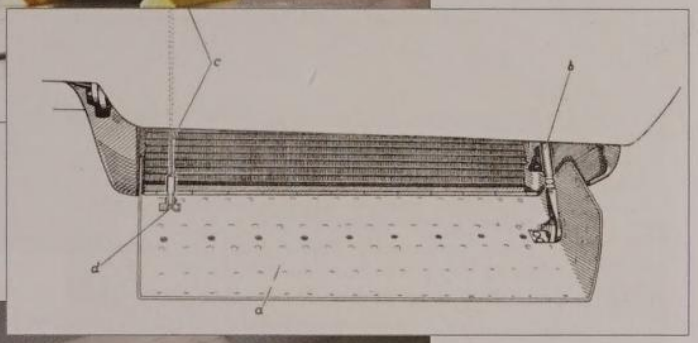
Starboard wing. Aileron details are visible. Note also wing tip navigation lamp. (Fotios Rouch)

Port wing, landing flap in the lower position. Flap indicator is also visible.

Bf 109E-4 during overhaul. Starboard wing, landing flap in the maximum lower position. Wing tip is removed. Slot in open position. Mooring ring is also visible.

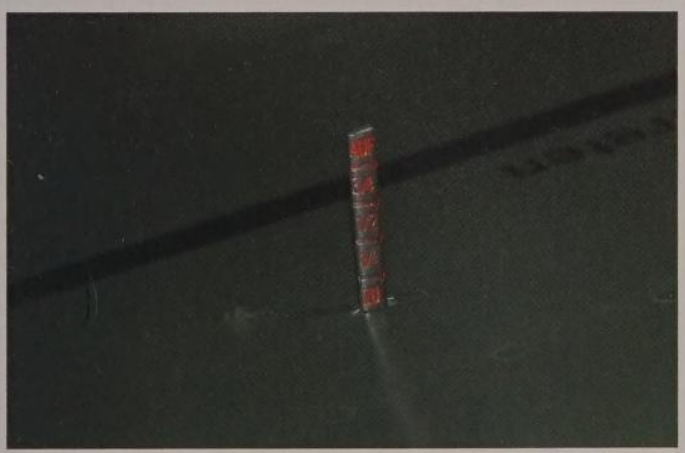
Port wing, L-shape pitot tube details.

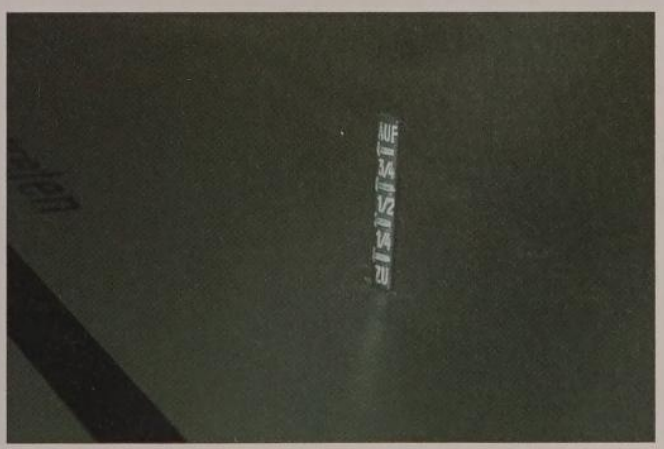
Port wing landing flap and wing-fuselage fairing. Note radiator ejector flap in fully open position and indicator on the wing. (Fotios Rouch)



Below: *Wing radiator flap and indicator. (Russian Technical Manual)*

Starboard wing radiator with fully open flap. (Fotios Rouch)

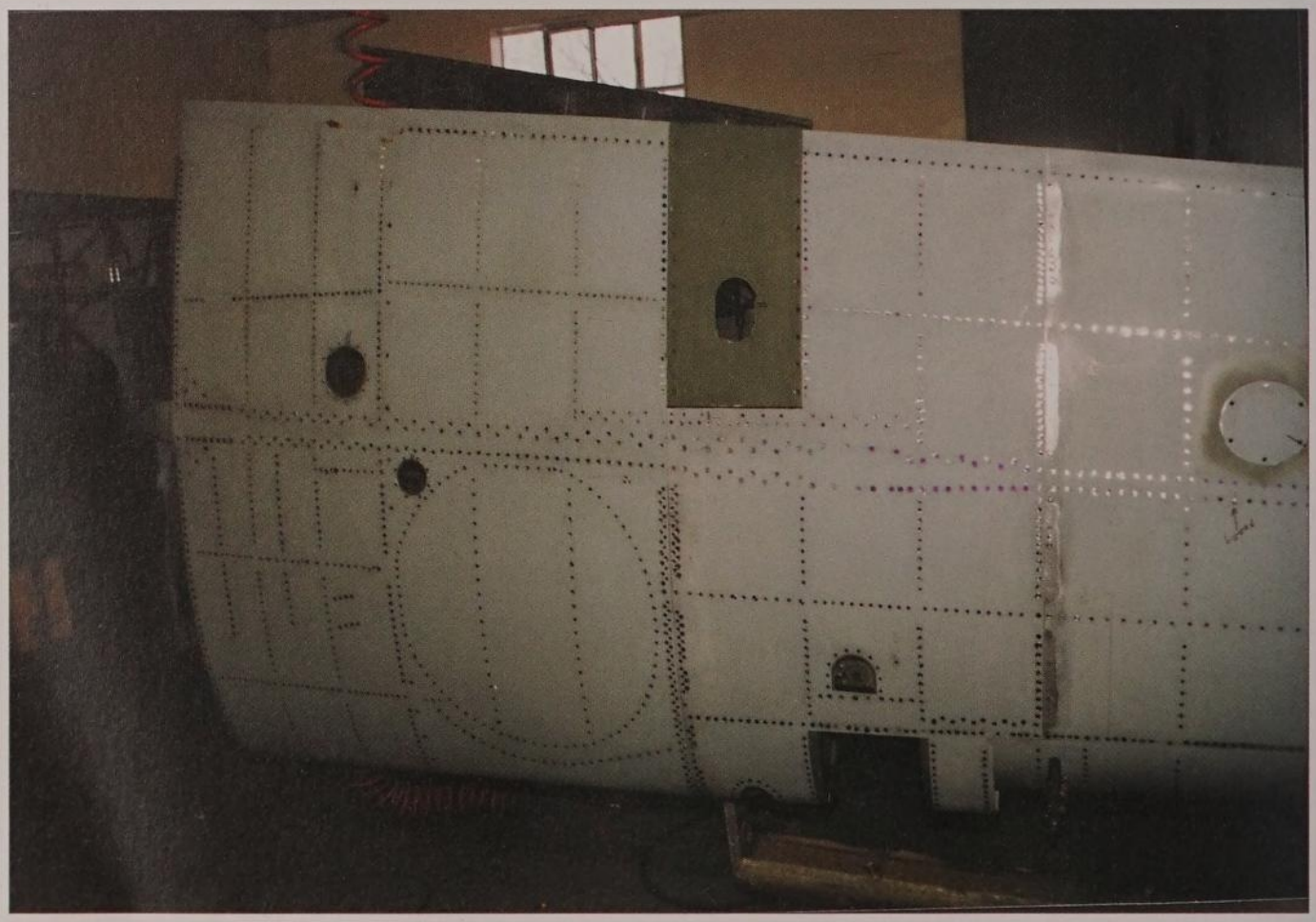


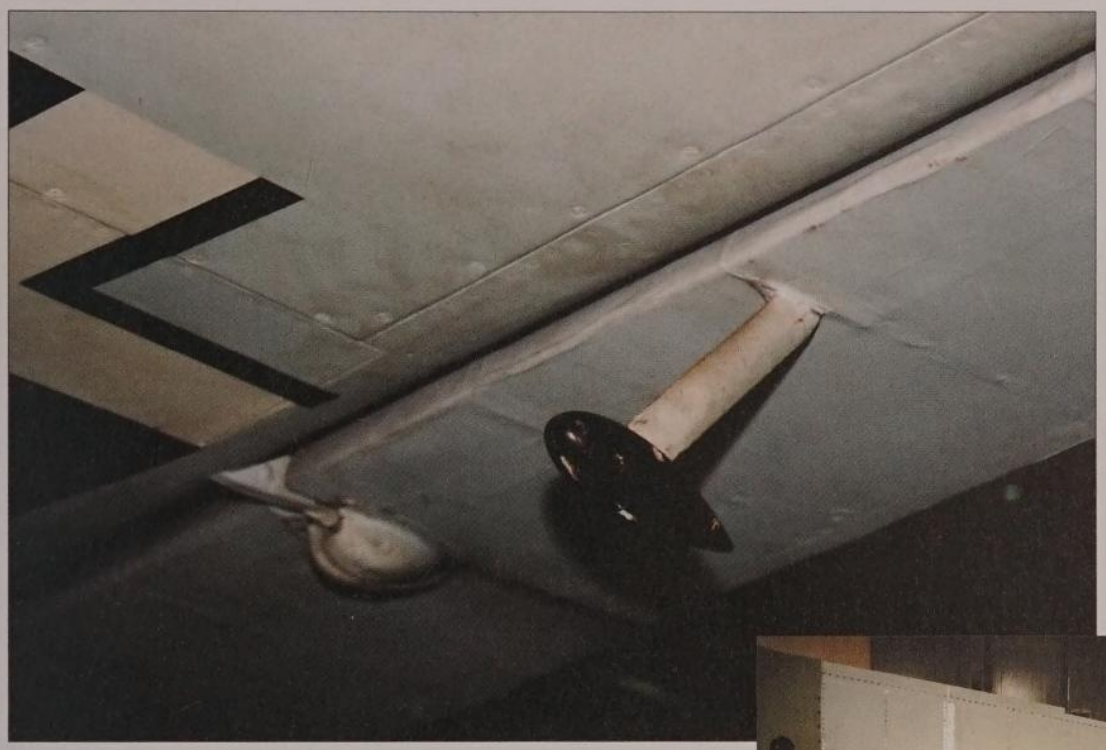


Two photos of the flap indicators on the port (left) and starboard (right photo) wings. (both David Weiss)

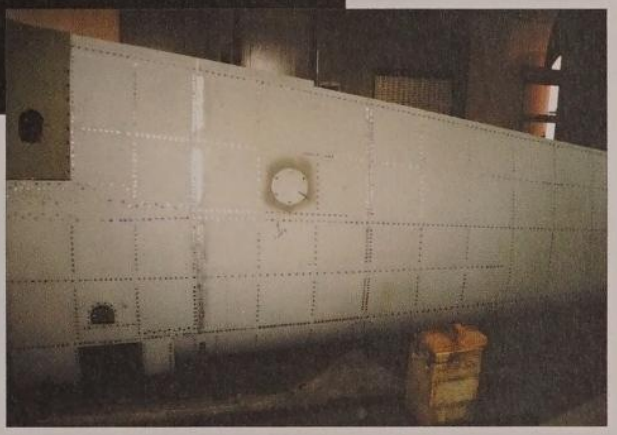
Above: Bf 109E-4 captured by the Allies. Aircraft in British markings with British serial AE479. Characteristic Bf 109E wing shape is visible.

Below: Bf 109E port wing under restoration. Upper surfaces riveting is visible. Wing leading edge slot is removed showing the slot's push-rod.



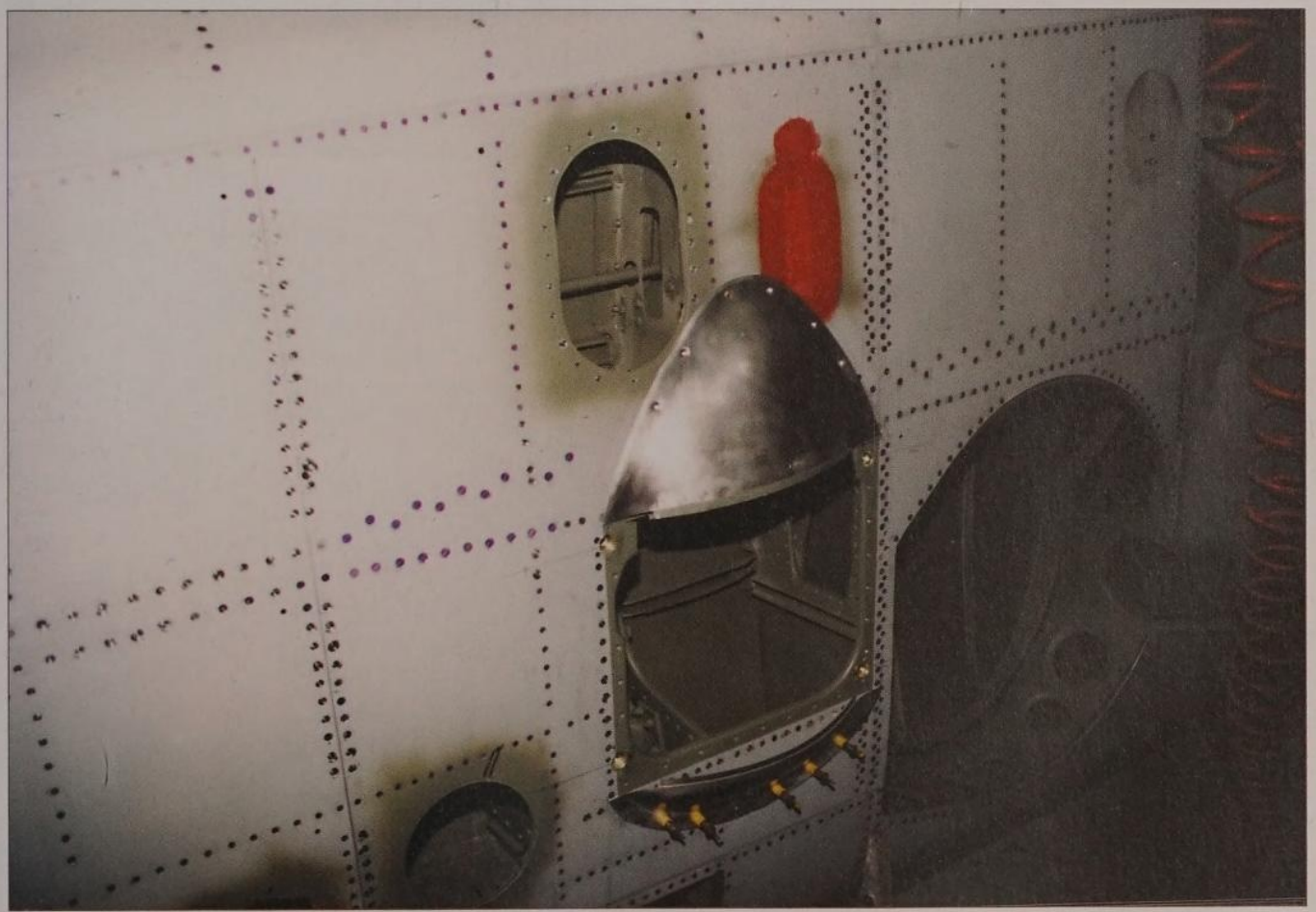


Port wing aileron mass balance and aileron hinge.



Right: *Another shot of the Bf 109E wing during restoration. Wing is not painted yet. Easily visible are access panels and rows of rivets.*

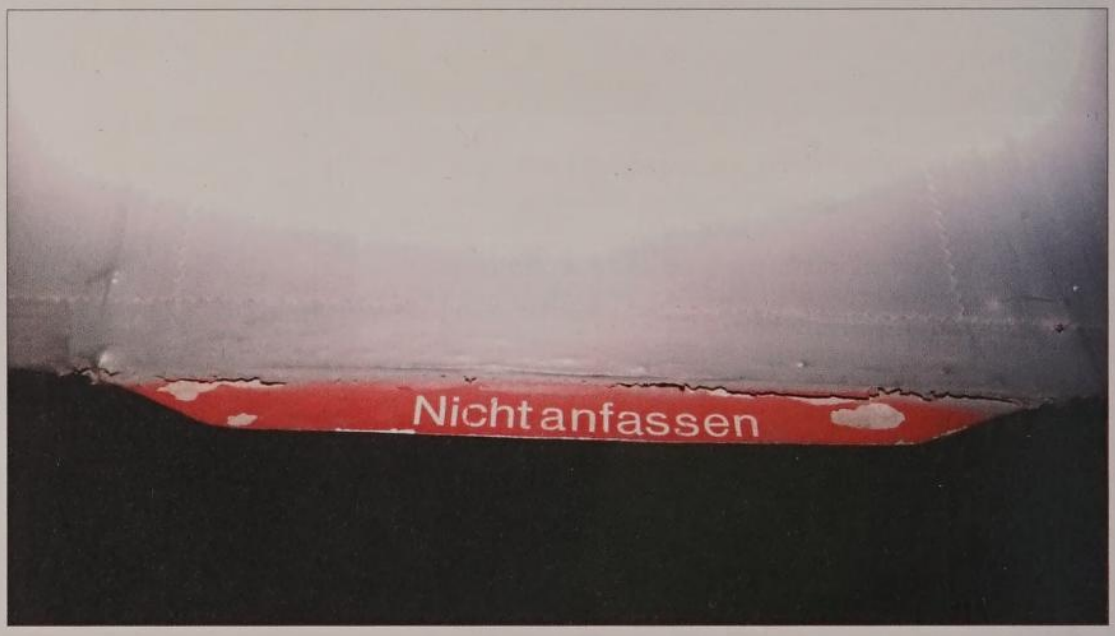
Below: *MG FF cannon well with cover removed. Note that other access panels are also removed.*



Above, left: *A mooring ring used for a rope which secured the aircraft to the ground.*

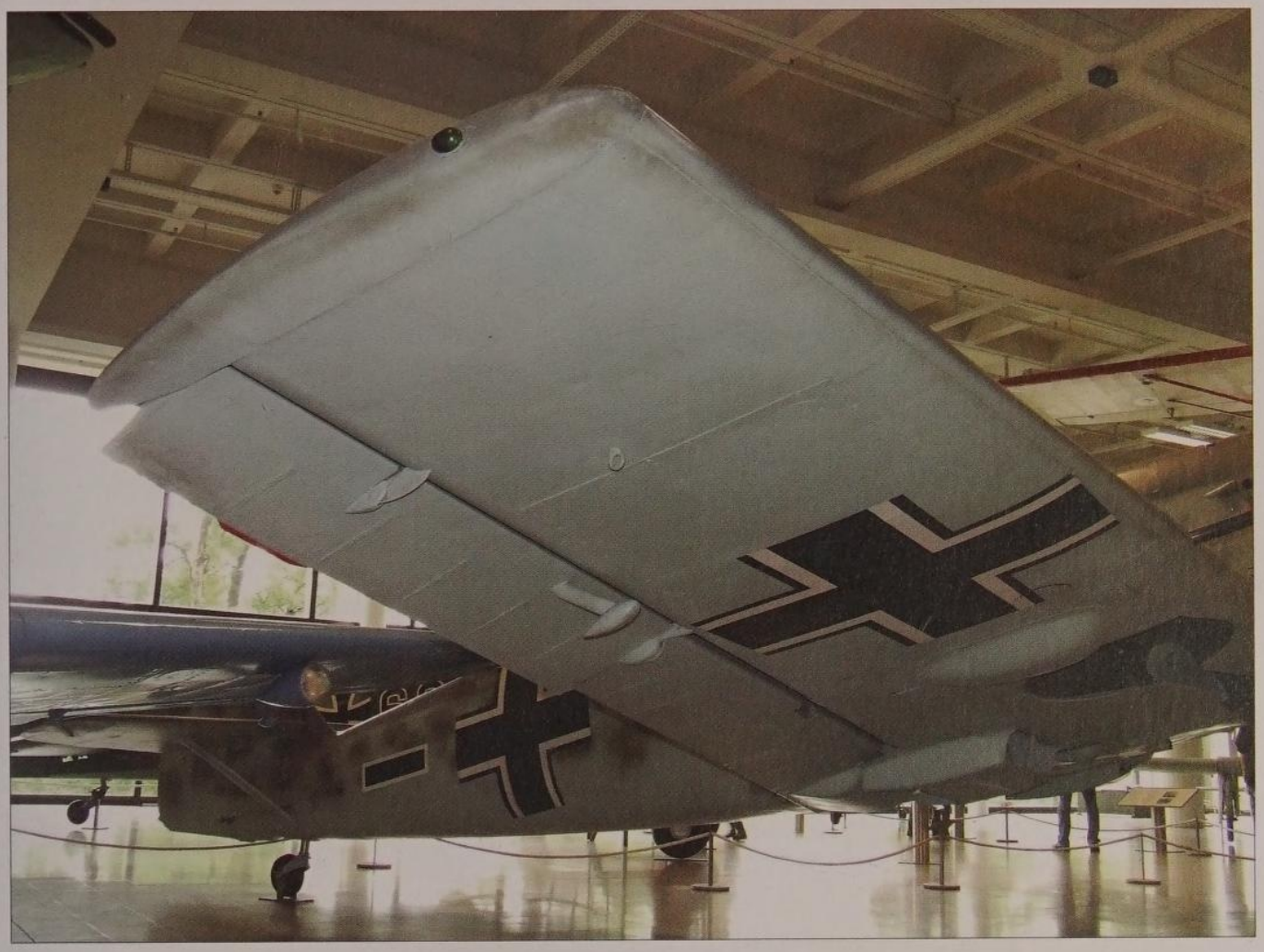
Above, right: *Mass balance on the aileron.*

Right: *The fixed tab of the aileron. All fixed tabs are painted in red with warning text.*



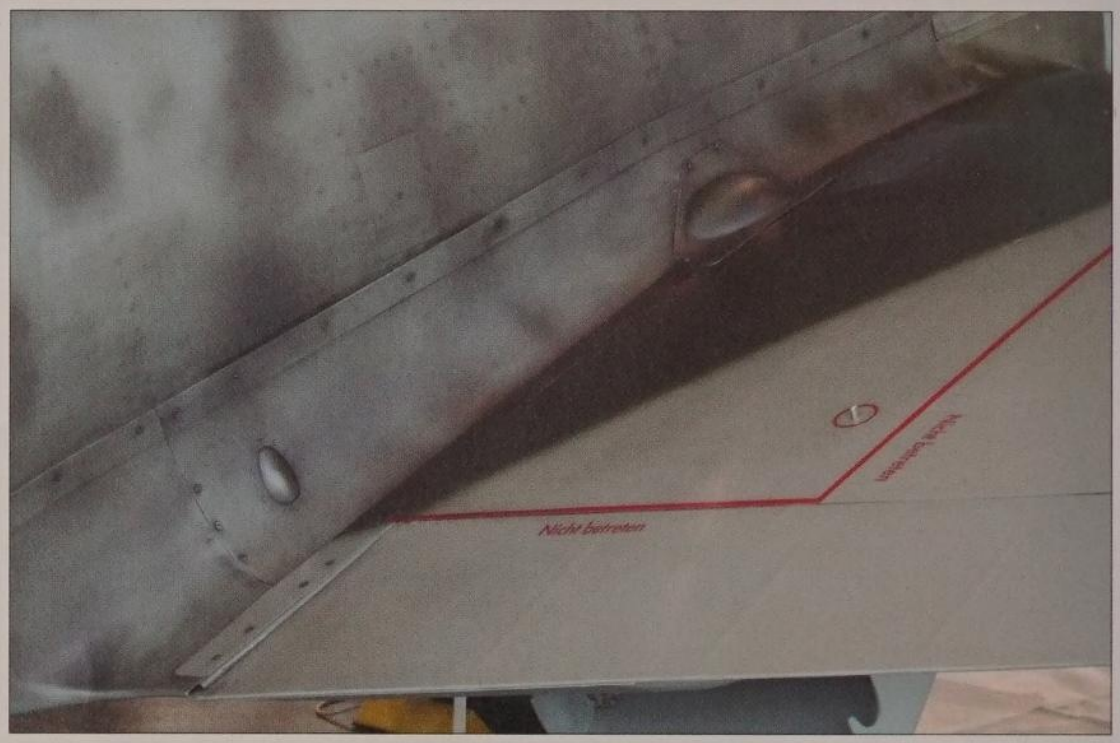
Starboard wing of the Bf 109E-7 before preservation. Original paint is still visible. (James Kightly)

Opposite page: *Two photos of the starboard wing underside. Details of the aileron are visible. Leading edge and front part of the wing's radiator are visible in the lower photo. (both James Kightly)*

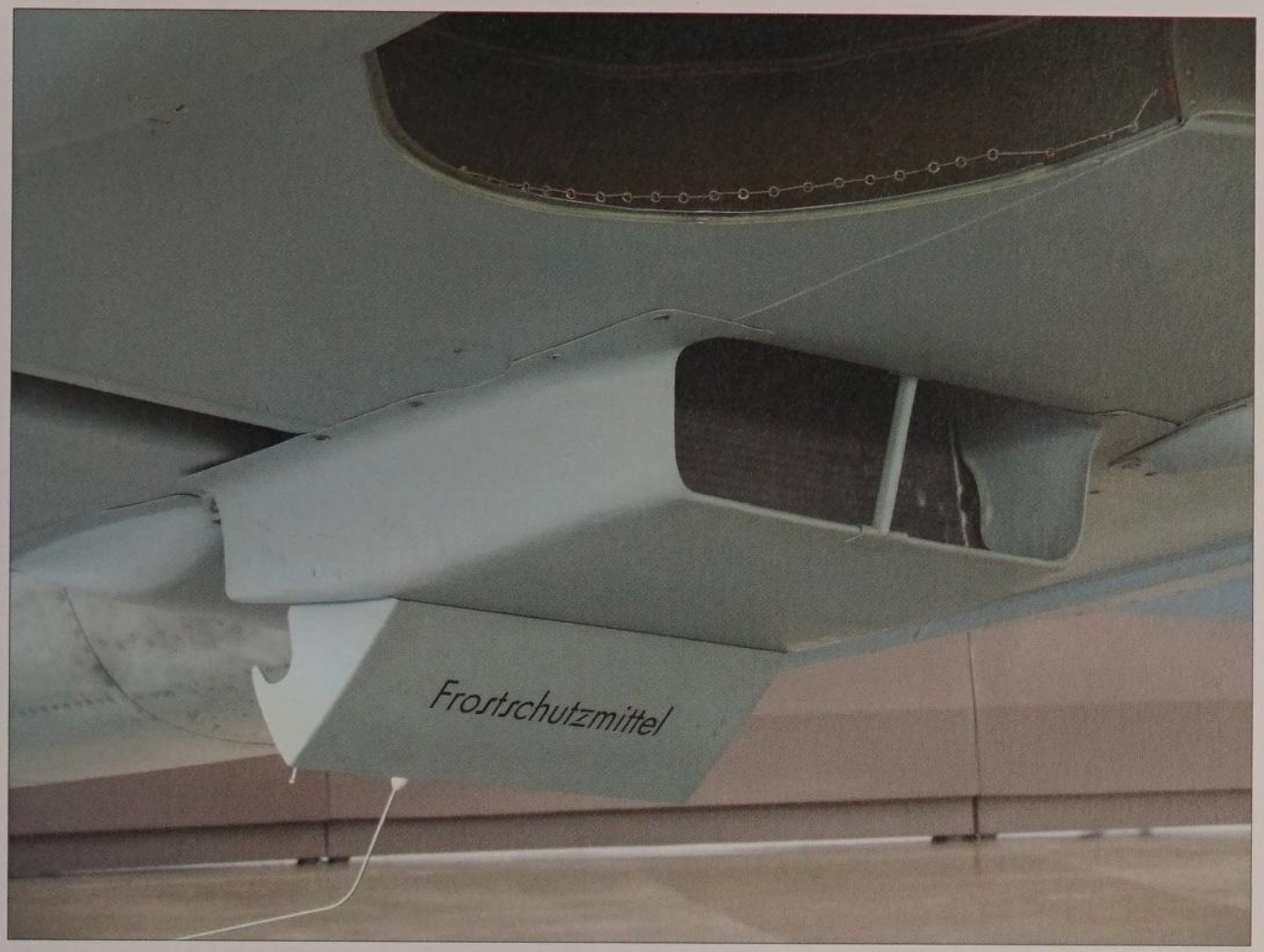


Bf 109E-7, starboard wing. Flap construction is visible with fabric removed. (James Kightly)

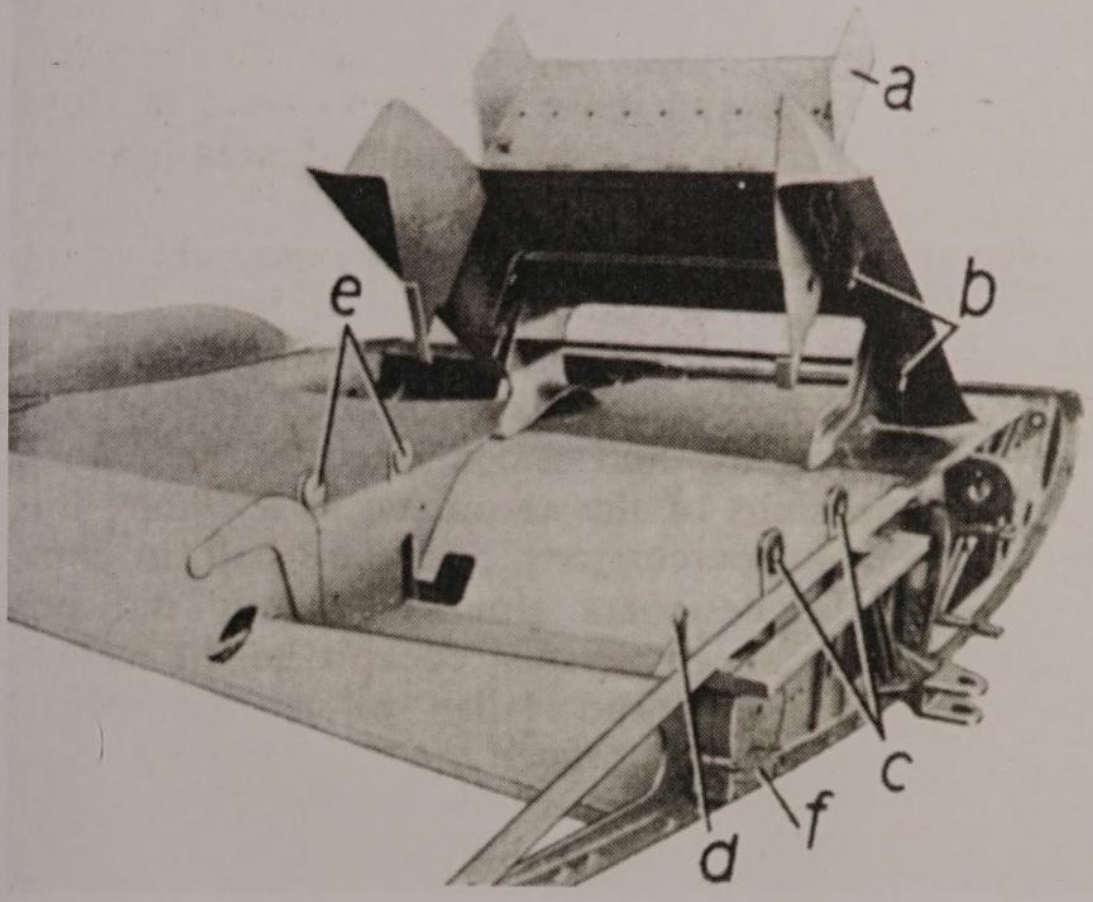
Wing-fuselage fairing details. Starboard landing flap is also visible. Note red warning lines and red circle around flap position indicator. (James Kightly)



Port wing uppersurfaces of Bf 109E-3. (James Kightly)



Starboard radiator with ejector flap in the open position. Aerial antenna under fuselage is a modern addition. (James Kightly)



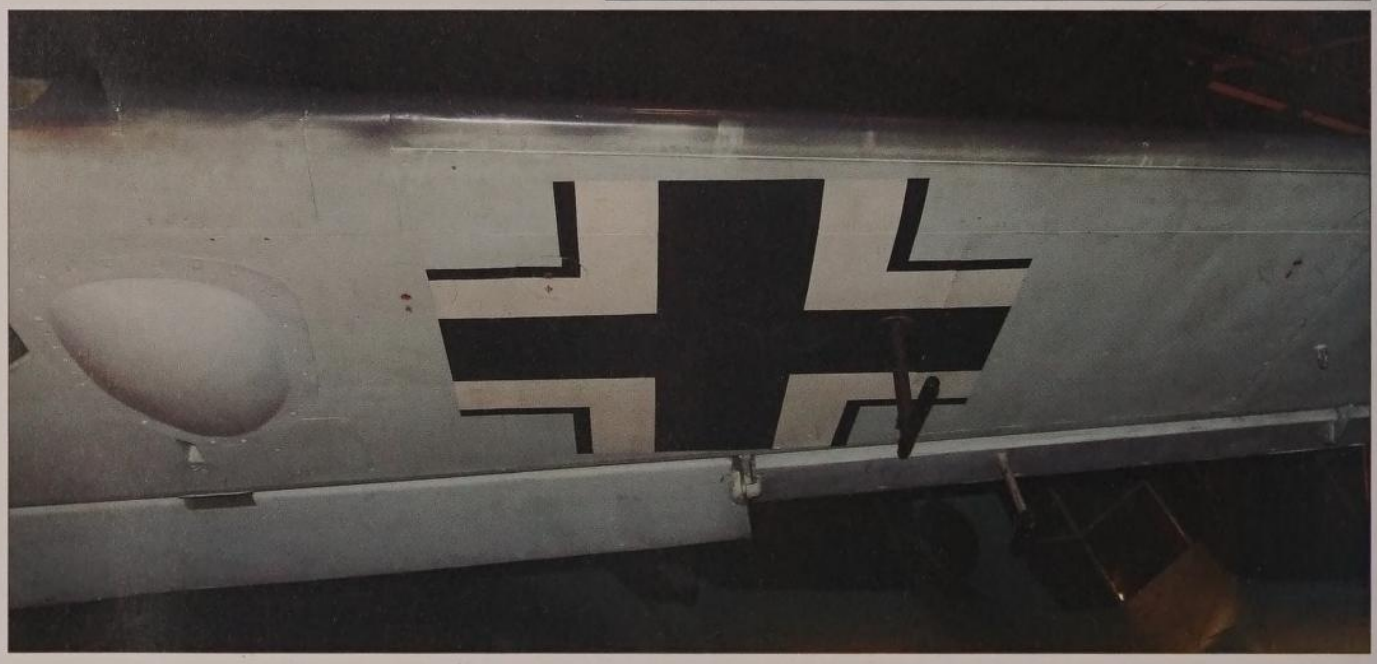
Wing radiator covers. Note that the radiator itself is missing. (Technical Manual)

Starboard navigation lamp. Note leading edge slot in open position.

Starboard wing underside. Cannon blister is visible, but the cannon itself is missing.

Port wing underside with cannon blister and pitot tube clearly visible.

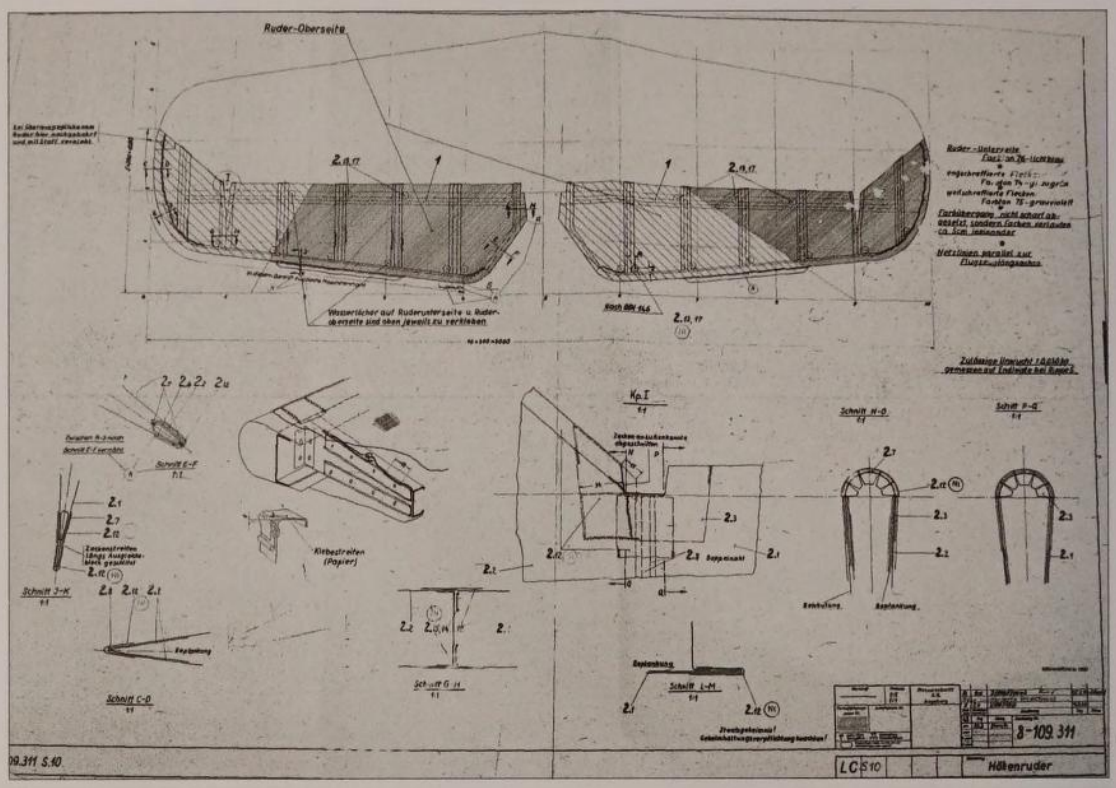
(All James Kightly)



Port side of the Bf 109E-3 tail. The tail strut, characteristic for early Bf 109s is visible. (Fotios Rouch)

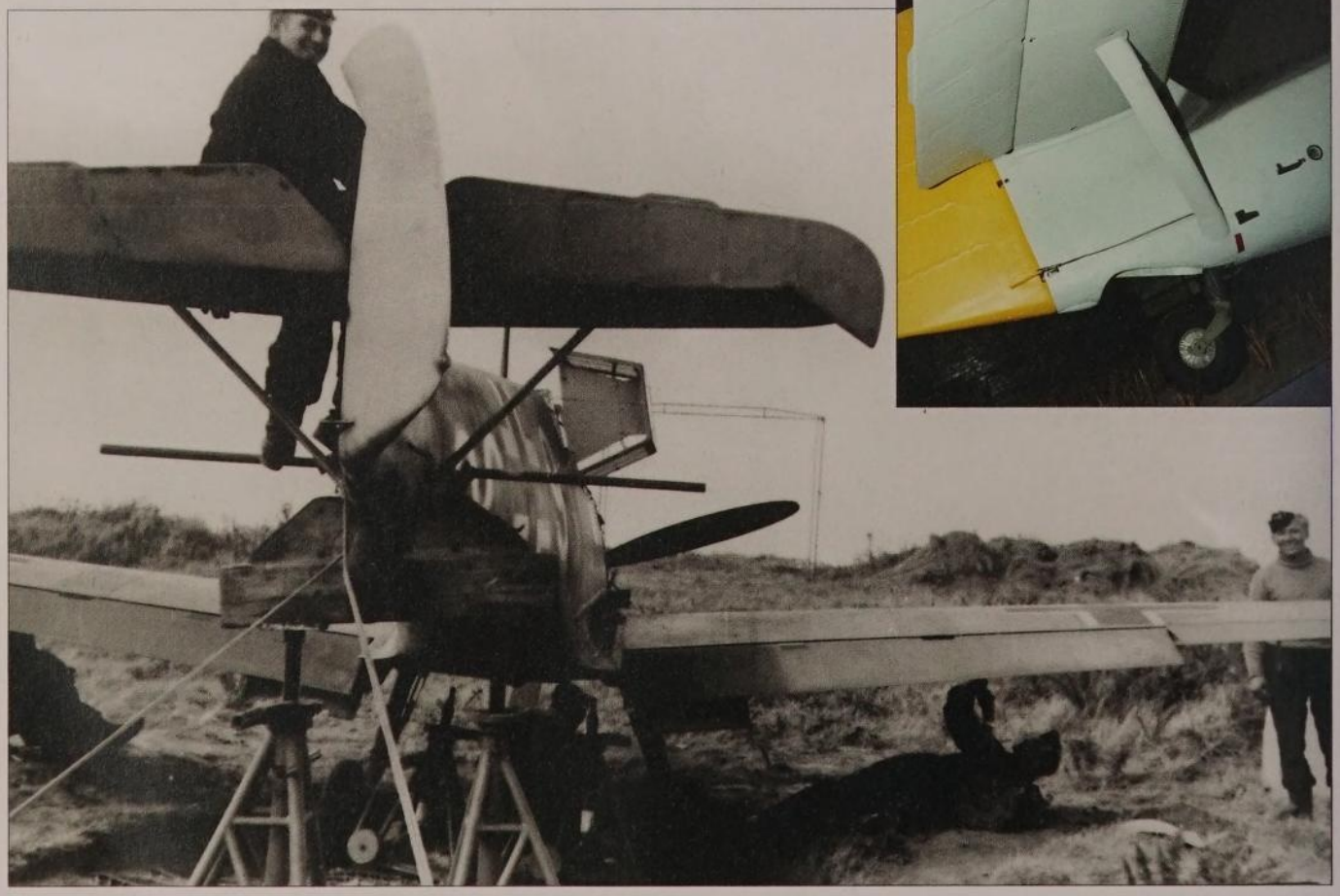
Empennage seen from the left. Rudder details are also shown with rudder control cable just above the tail wheel. (Fotios Rouch)

Original factory blueprint of the elevator details and dimensions.



Starboard horizontal stabilizer and elevator underside.

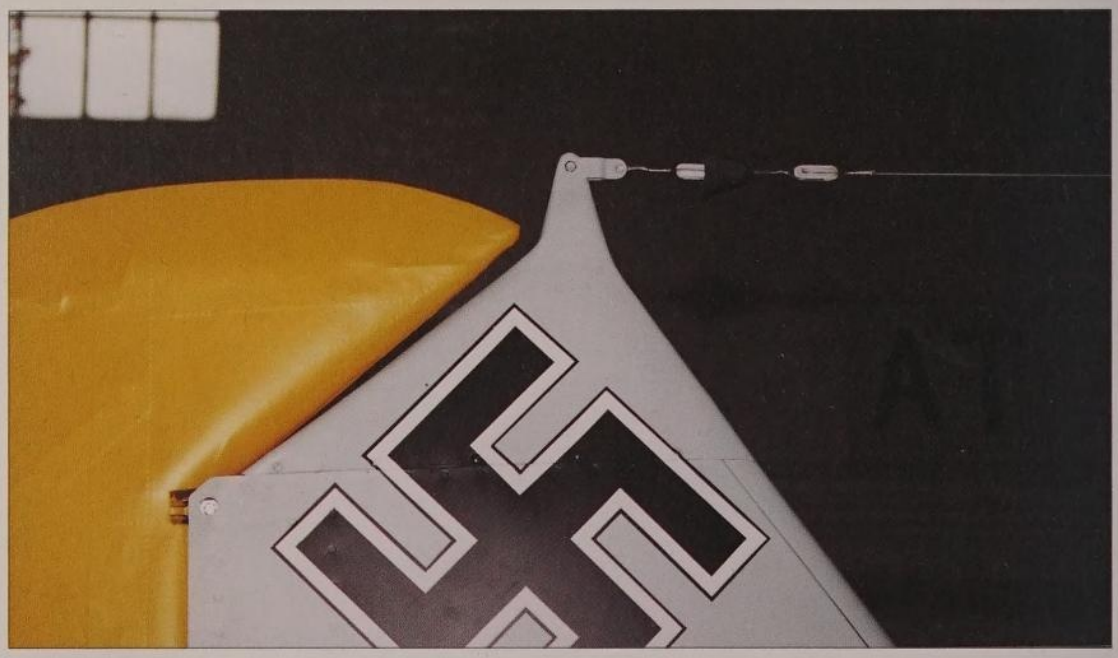
Rear view of the Bf 109E-4. Note also later version of the canopy with rear armoured plate.



Partially destroyed empennage of the Bf 109E-7. Elevator's ribs are visible. (James Kightly)

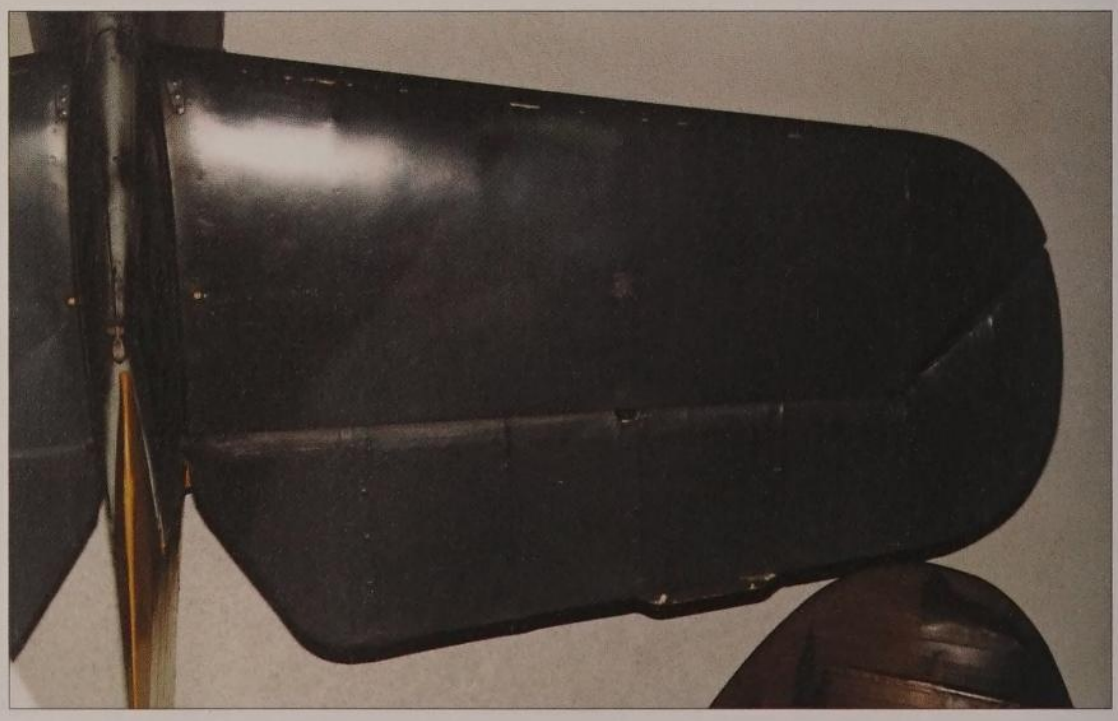
Three photos of the Bf 109E-3 empennage. (All James Kightly)

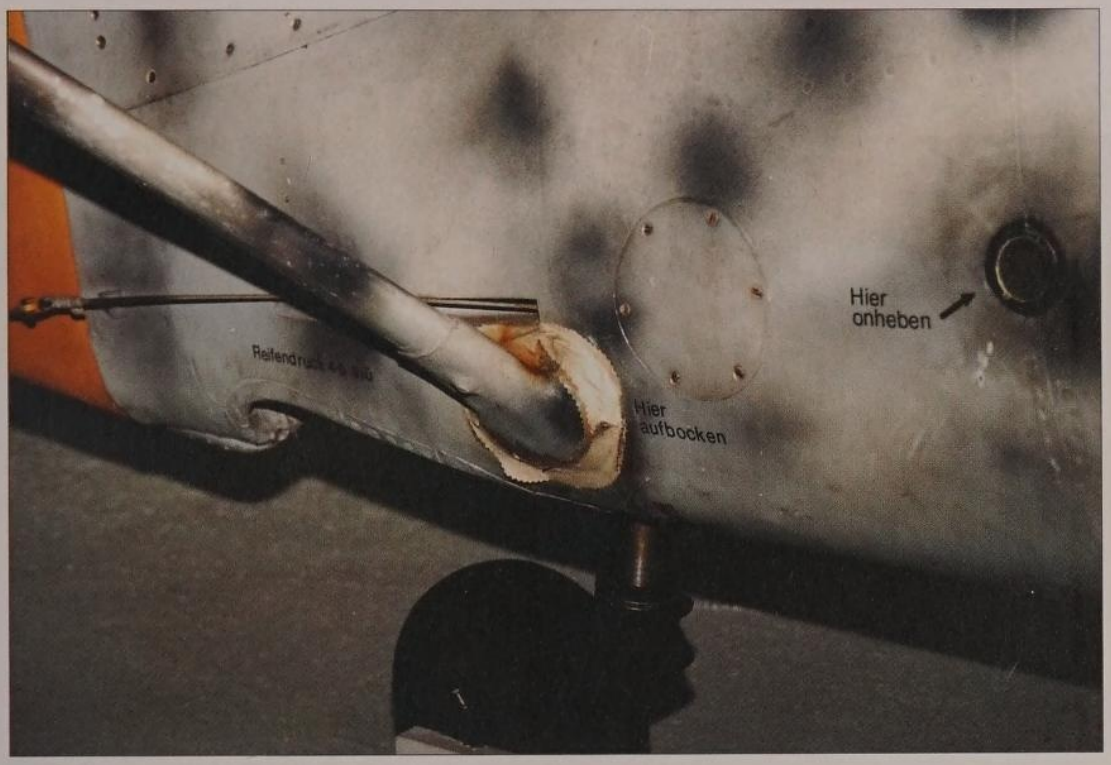
Above: Clear (white) tail navigation lamp. ***Above, right:*** Port side of the empennage. (Both James Kightly)



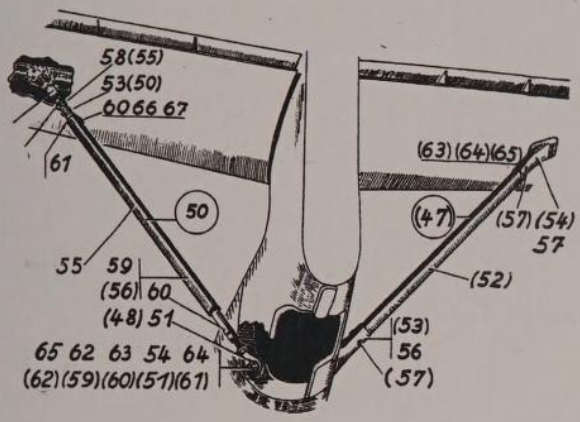
Right: Vertical fin tip with short radio antenna mast. The conical plastic insulator and metal spring is visible.

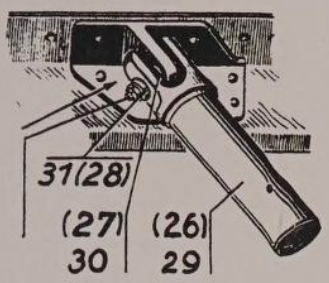
Starboard elevator and horizontal stabilizer, uppersurfaces..





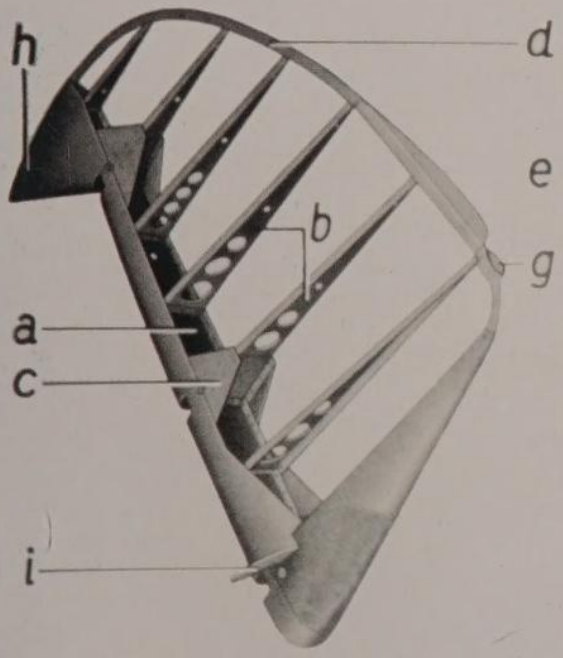
Tailplane support strut, here without strut fairing. Above the strut mounting point the rudder control cable is visible.
A lifting bar insertion hole is also visible.

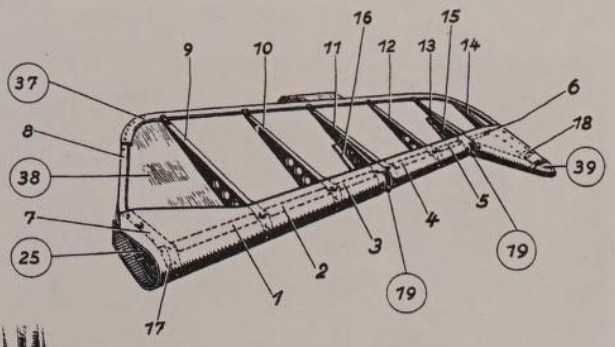


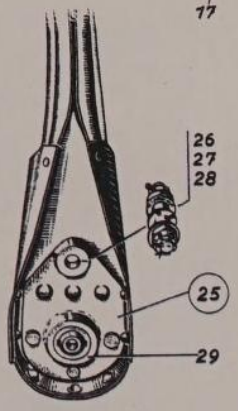


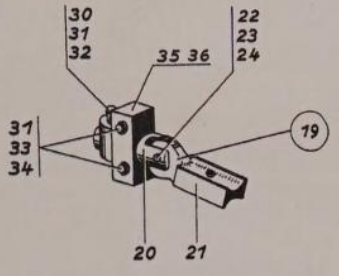
Middle: *Two drawings of the tailplane support details.*
(Technical Manual)

Bottom, left: *Rudder structure shown without fabric.*
Bottom, right: Elevator structure details also shown with fabric removed.
(Drawings from Spare Parts Manual)



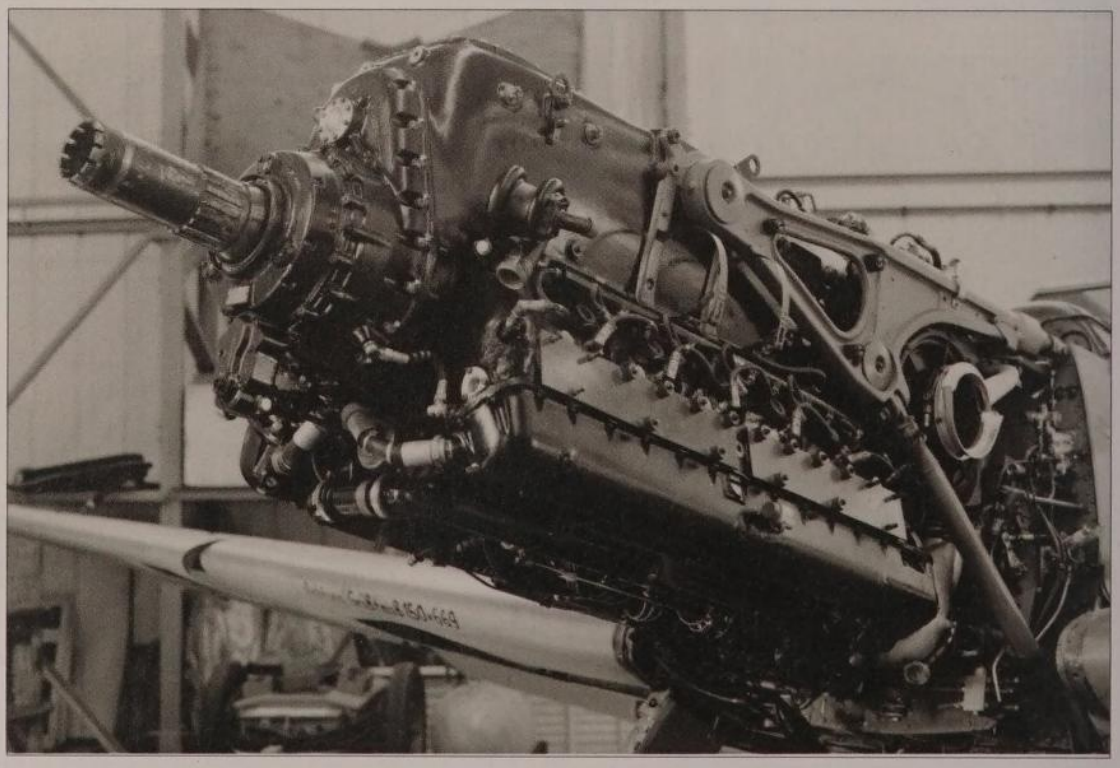




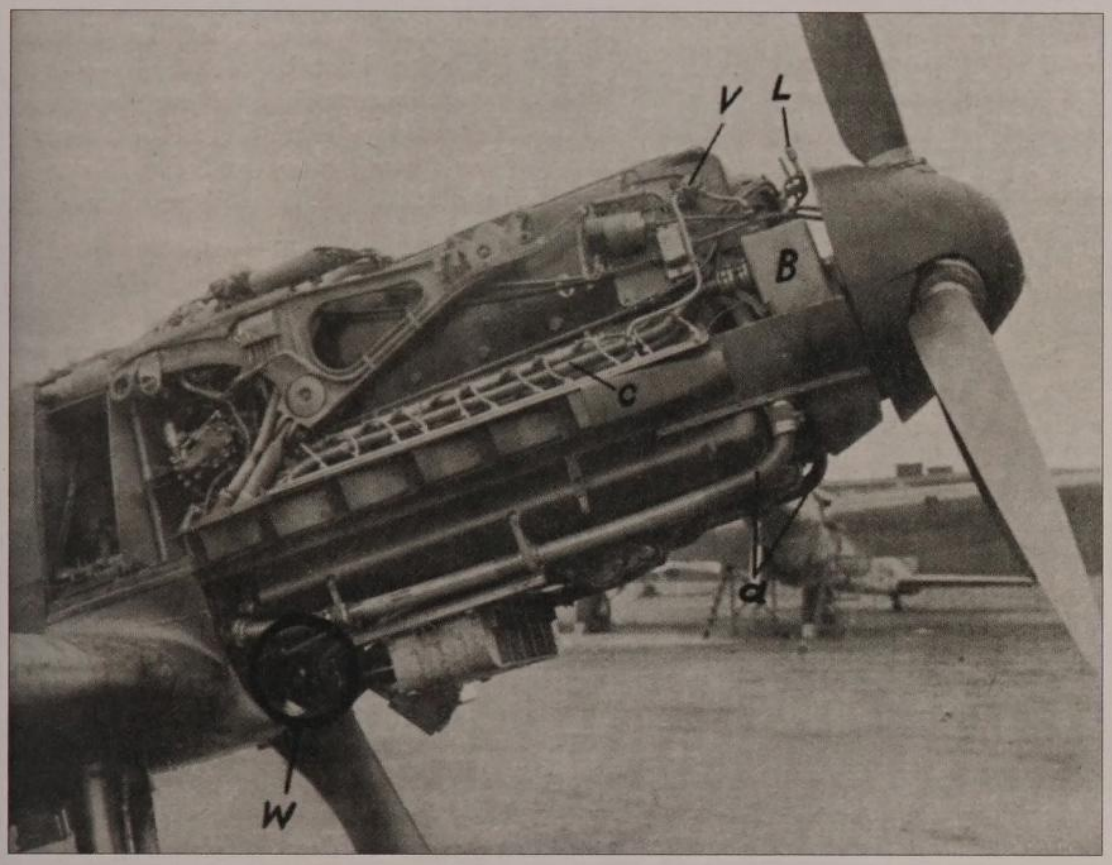


Engine

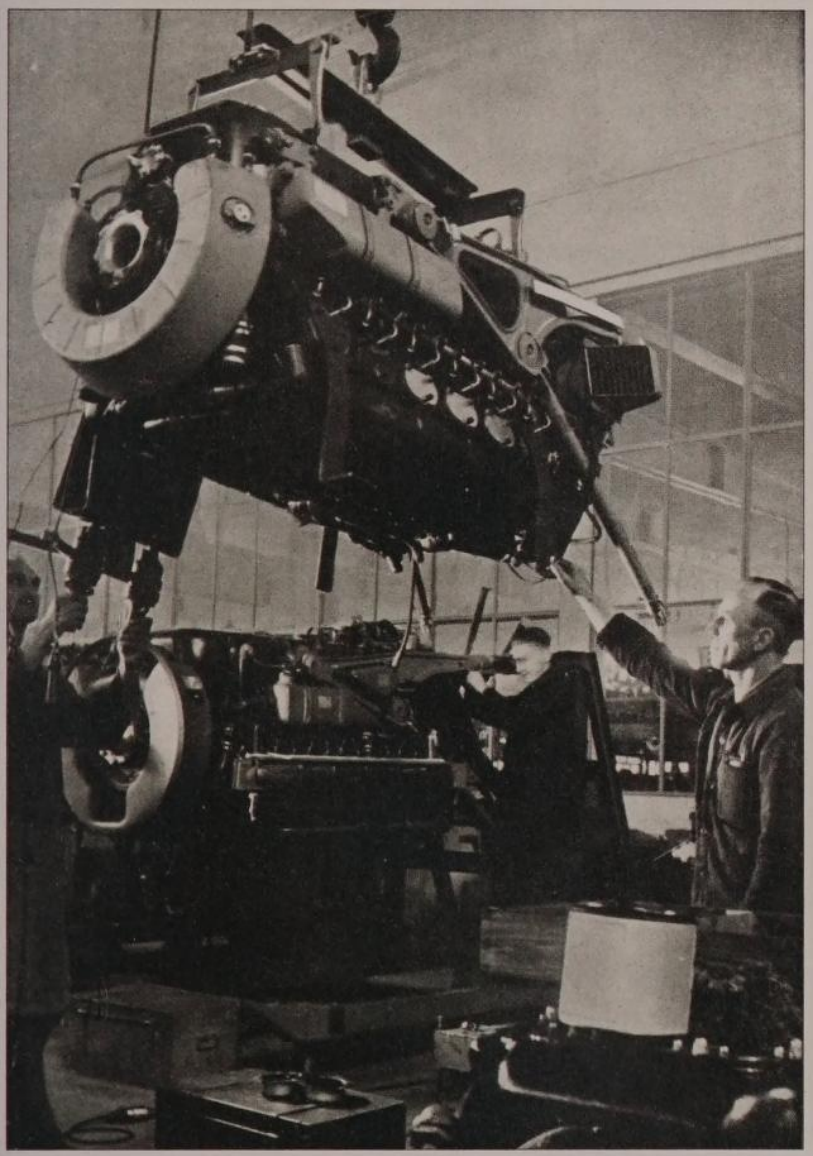
Above: Beautiful shot of the DB 601 A engine mounted to the Bf 109E-4 preserved at Hendon. (Gary R. Brown)



A new DB 601 A engine on the Bf 109E production line.

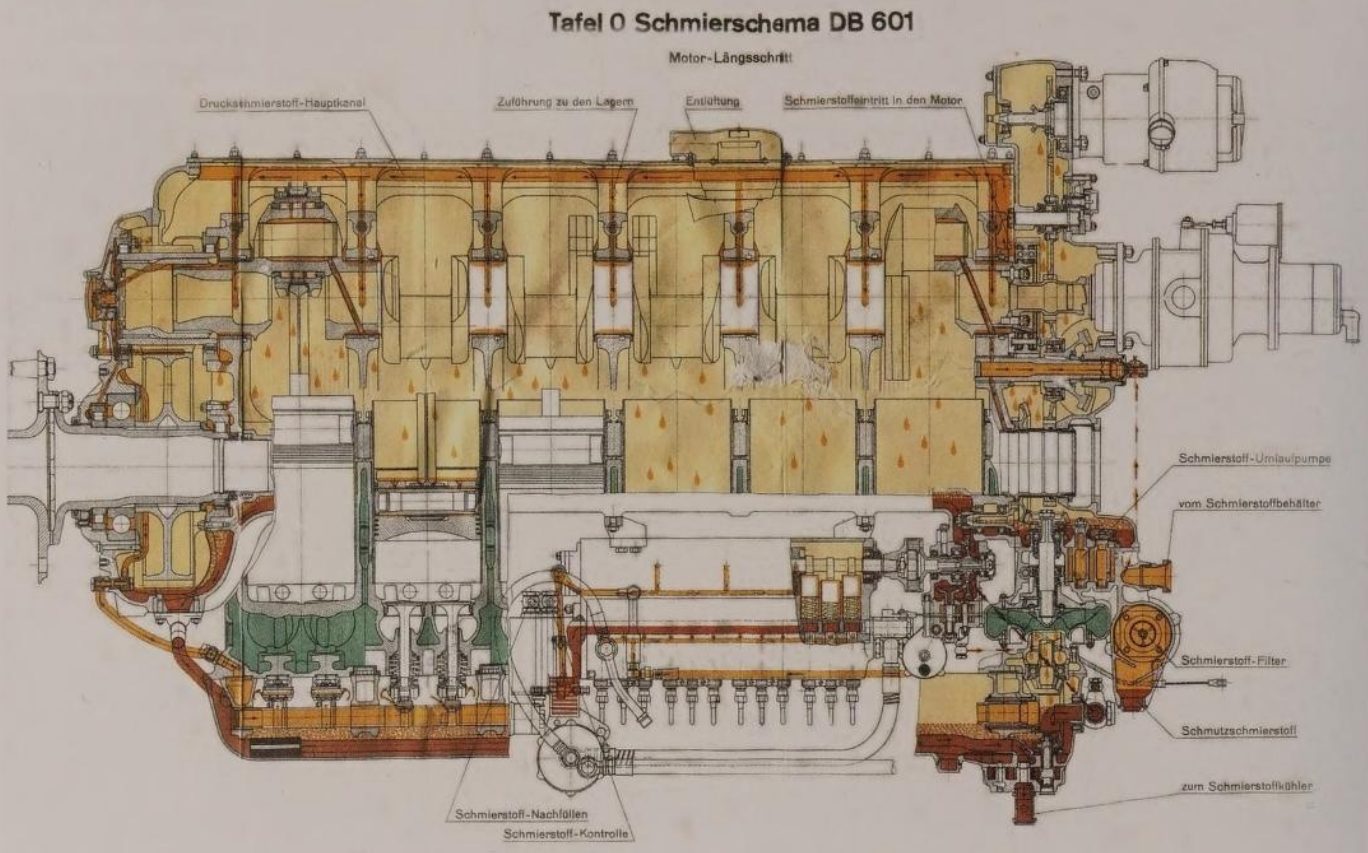


Starboard side of the Bf 109E with cowling panels removed. Letters describing some details of overpressure cooling system (pressure circuit).
B. Coolant tank,
c. Outlet diffuser,
d. Liquid coolant pipes,
L. Venting valve,
V. Pressure equalizing valve,
W. Connectors.



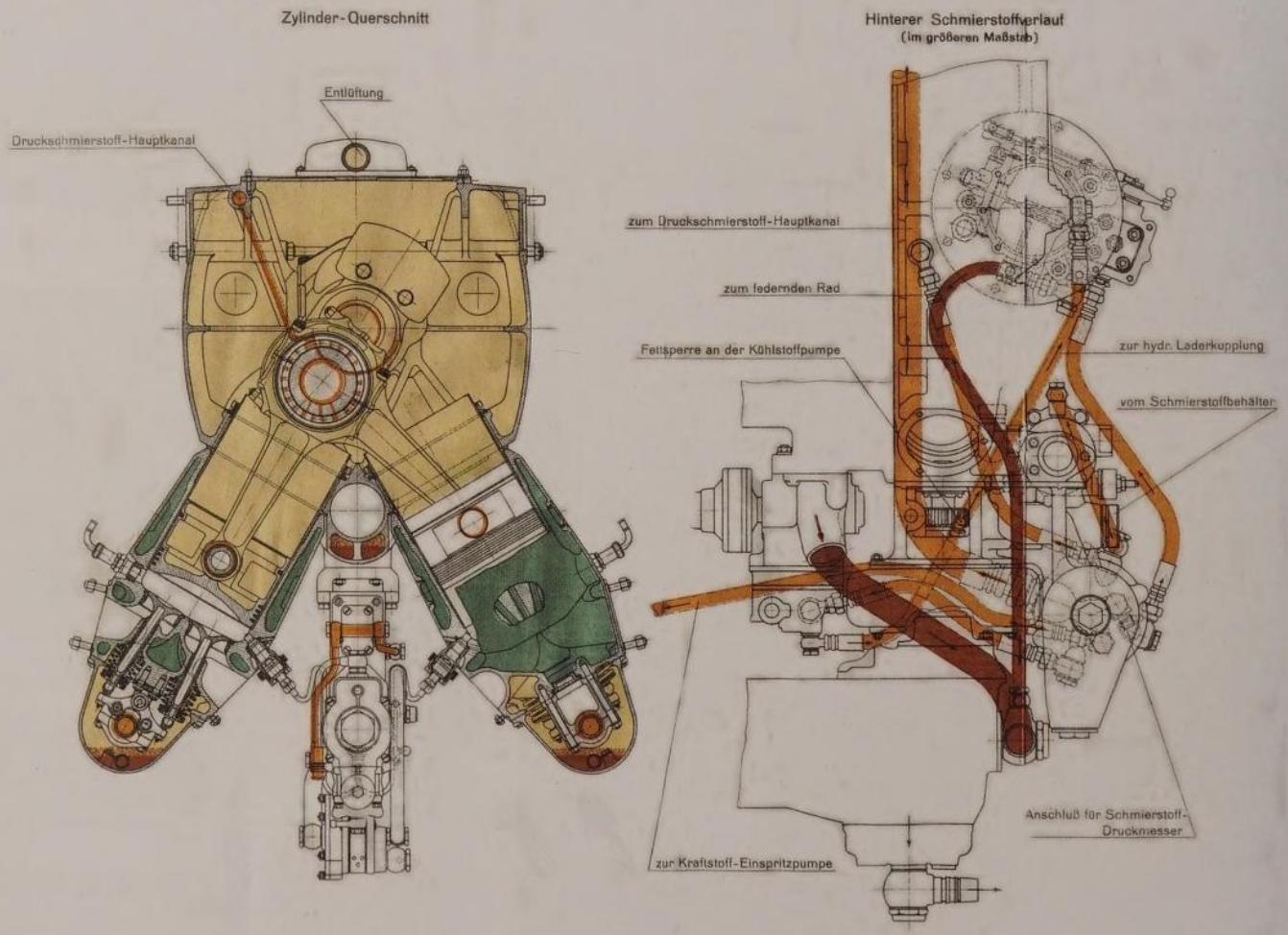
Mounting of the complete engine set (DB 601 N) to the fuselage, in the Messerschmitt factory. Note coolant tank in front of the engine and additional oil tank.

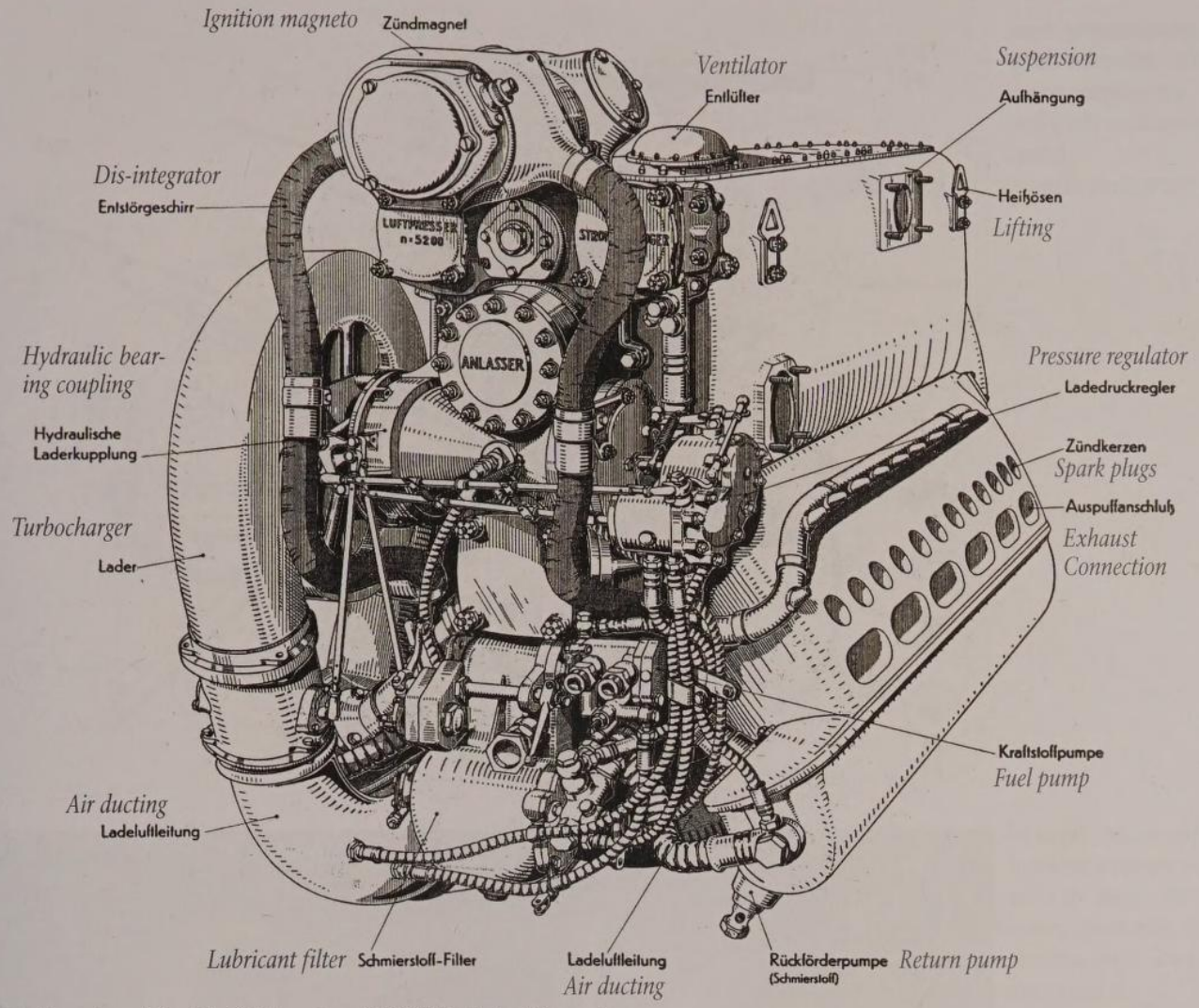
Mercedes-Benz wartime advert published in 'Adler' magazine.



Two drawings of the DB 601 lubrication scheme. (Drawing from DB 601 Engine Technical Manual)

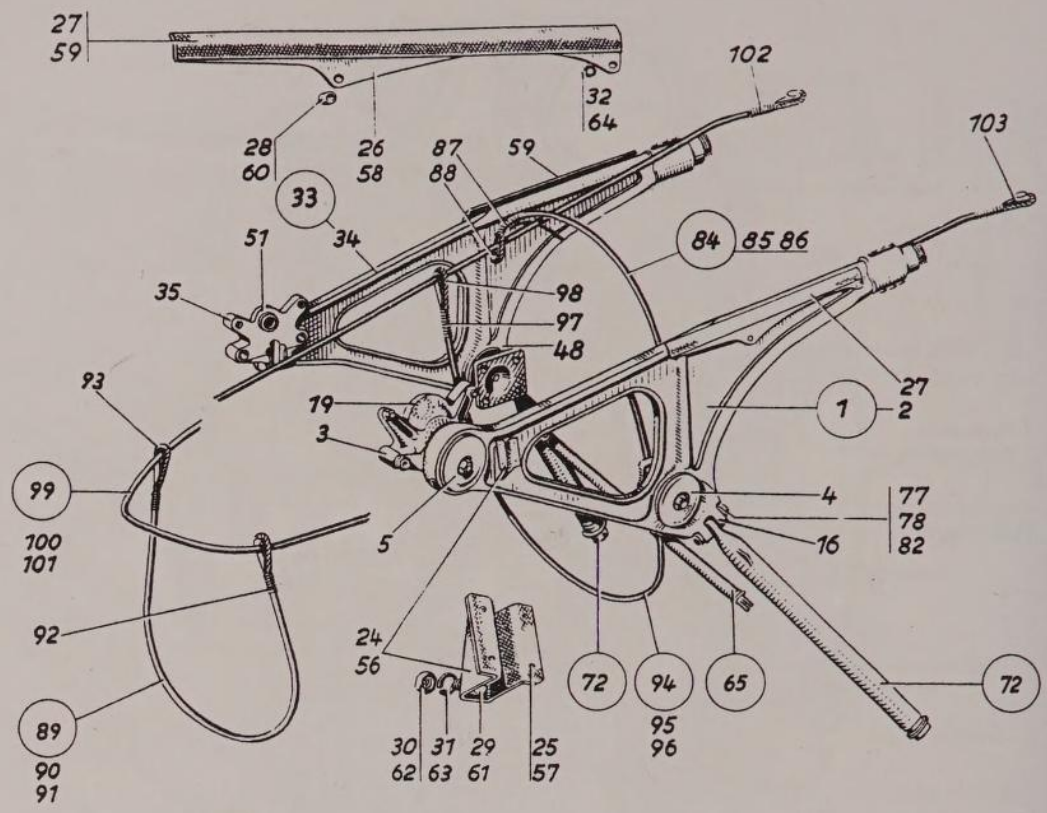
Opposite page, bottom: *Starboard side of the engine. Mounting frame details are clearly visible.*



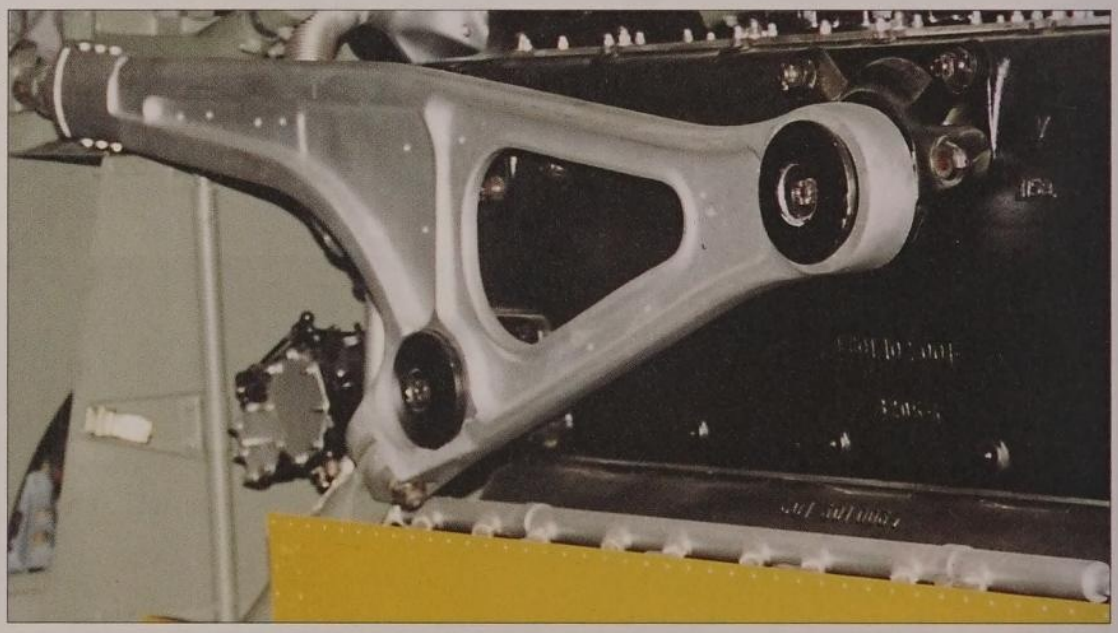


Above: Rear view of the DB 601 A engine. (DB 601 Technical Manual)

Engine mounting frame. 4 &5 – Vibration dampening engine mount connections (see photo below). (Spare Parts Manual)

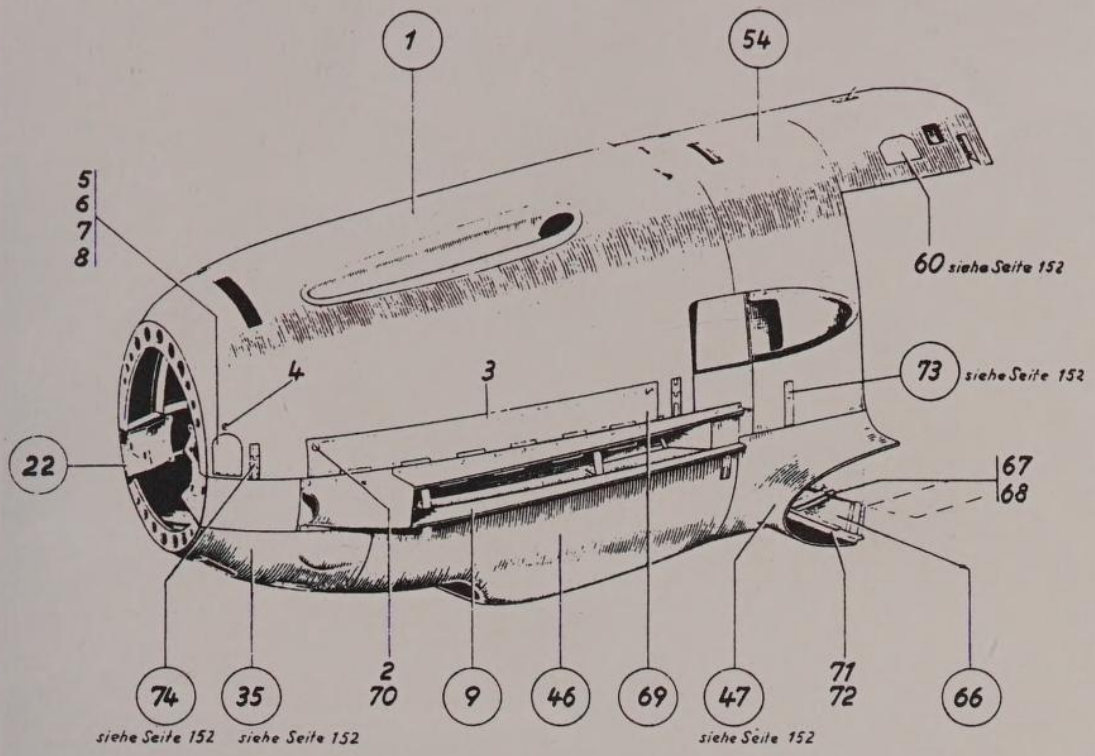


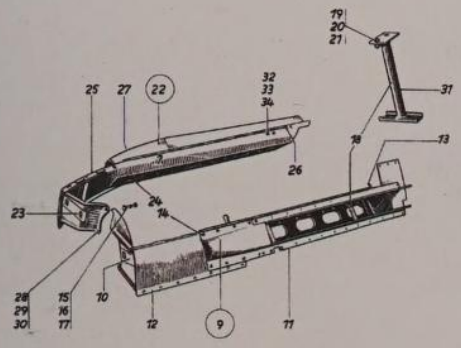
Magnesium forged engine mount is attached to the engine via vibration dampening connectors and to the airframe in two points.



Wartime photo of the starboard engine side. All panels are removed.

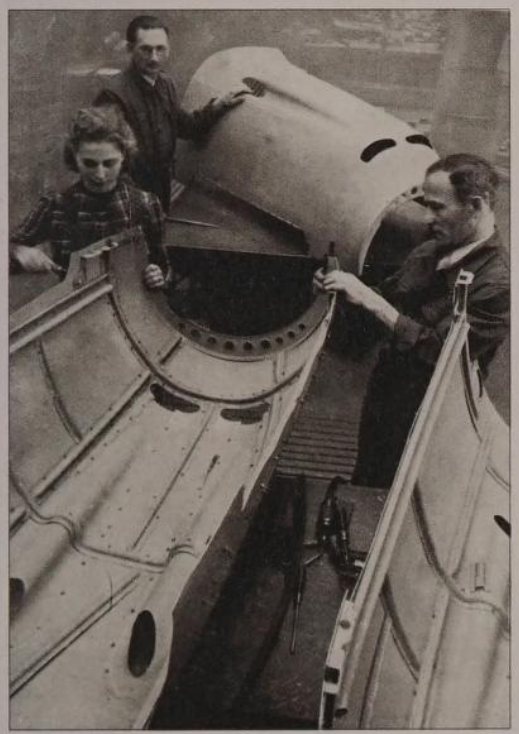
Engine cowling panels. (Spare Parts Manual)





Left: Exhaust covers. (Spare Parts Manual)

Bottom, left: Engine cowling panels – inside view.
Below: Port side of the engine cowling. (James Kightly)

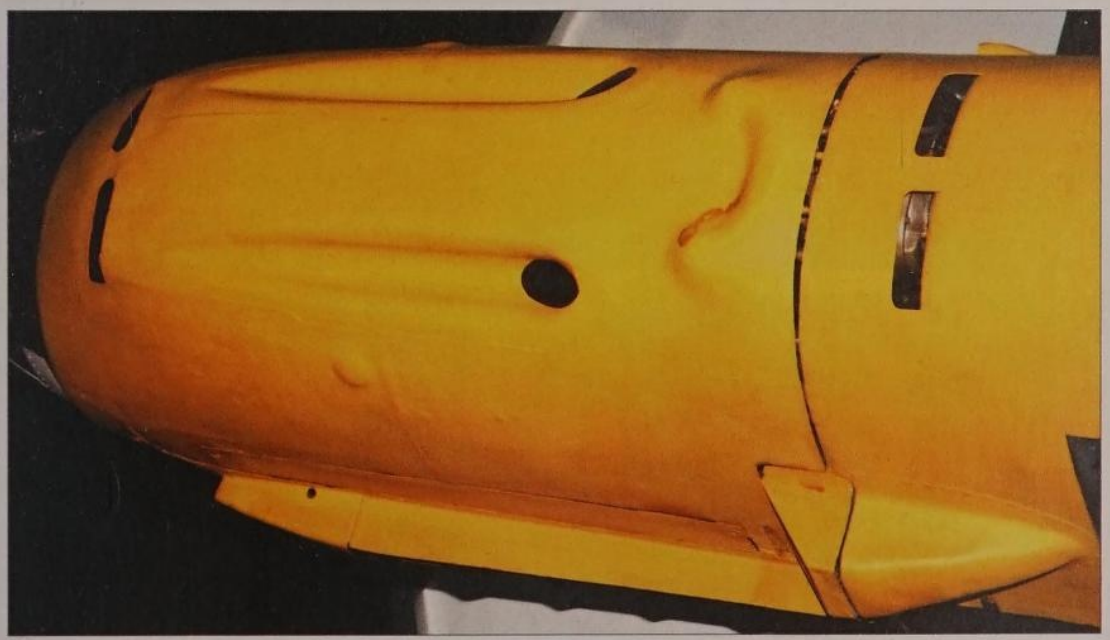


Front, port side view of the Bf 109E-3 cowling. The typical bulges are clearly shown. (Fotios Rouch)

Front view of the same aircraft as above. Oil cooler is visible. (Fotios Rouch)

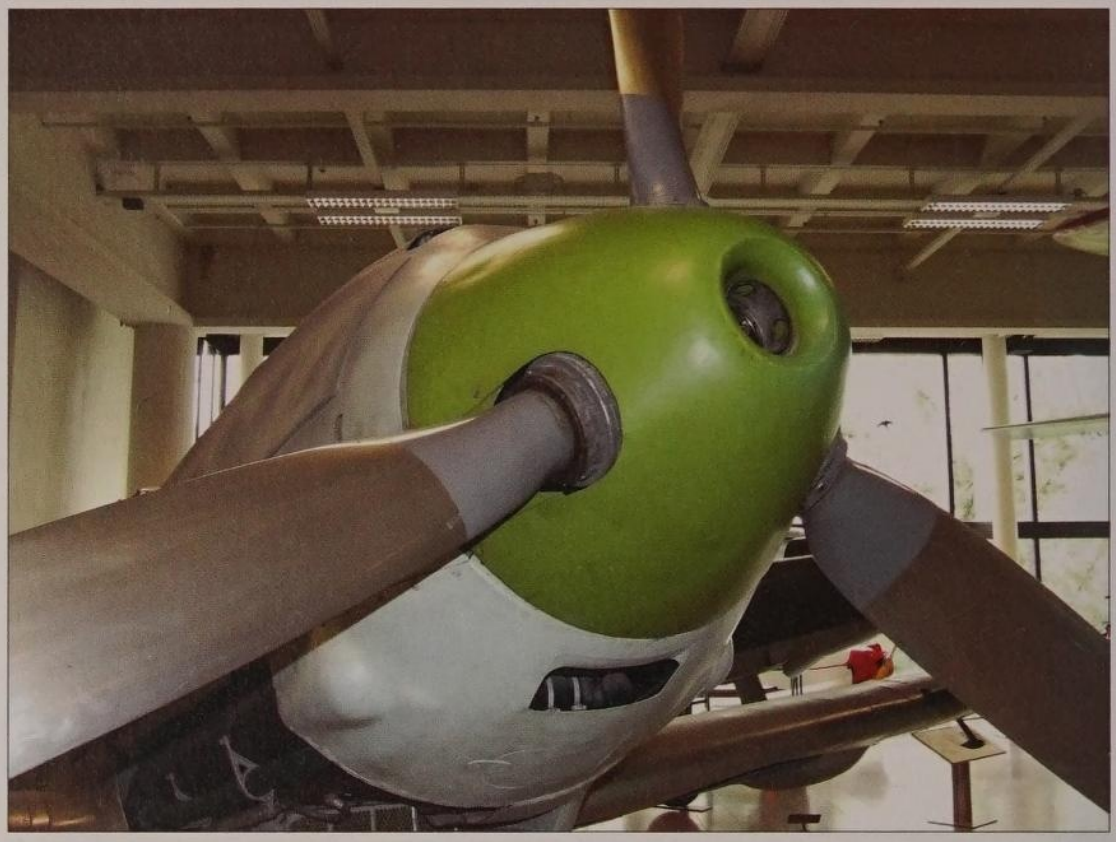
Port side of the cowling. Note air intake and exhaust details. The small circular bulge in the front is also visible. (Fotios Rouch)

Port side of the Bf 109E-7 with many details missing. Note the shape of the lower cowling panel with oil radiator. (James Kightly)



Upper side of the engine cowling. The fuselage guns are missing.

Spinner and propeller details of the Bf 109E preserved in Deutsches Museum, Munich, Germany. It is Bf 109E-3, W.Nr. 790. (James Kightly)



Starboard view of the spinner and propeller details of the Bf 109E-4. (James Kightly)

***Right:** Air screw hub and front side of the engine.*

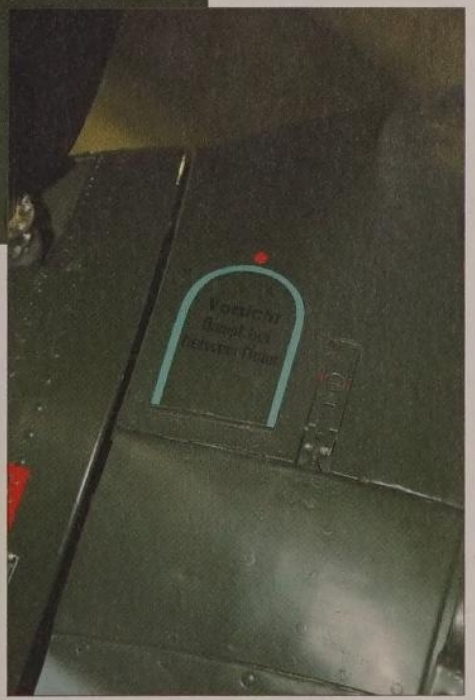
***Far left:** Another view of the Bf 109E-4 spinner.*

Starter crank hole and fairing located on the starboard side. Lever locks are clearly visible. (James Kightly)

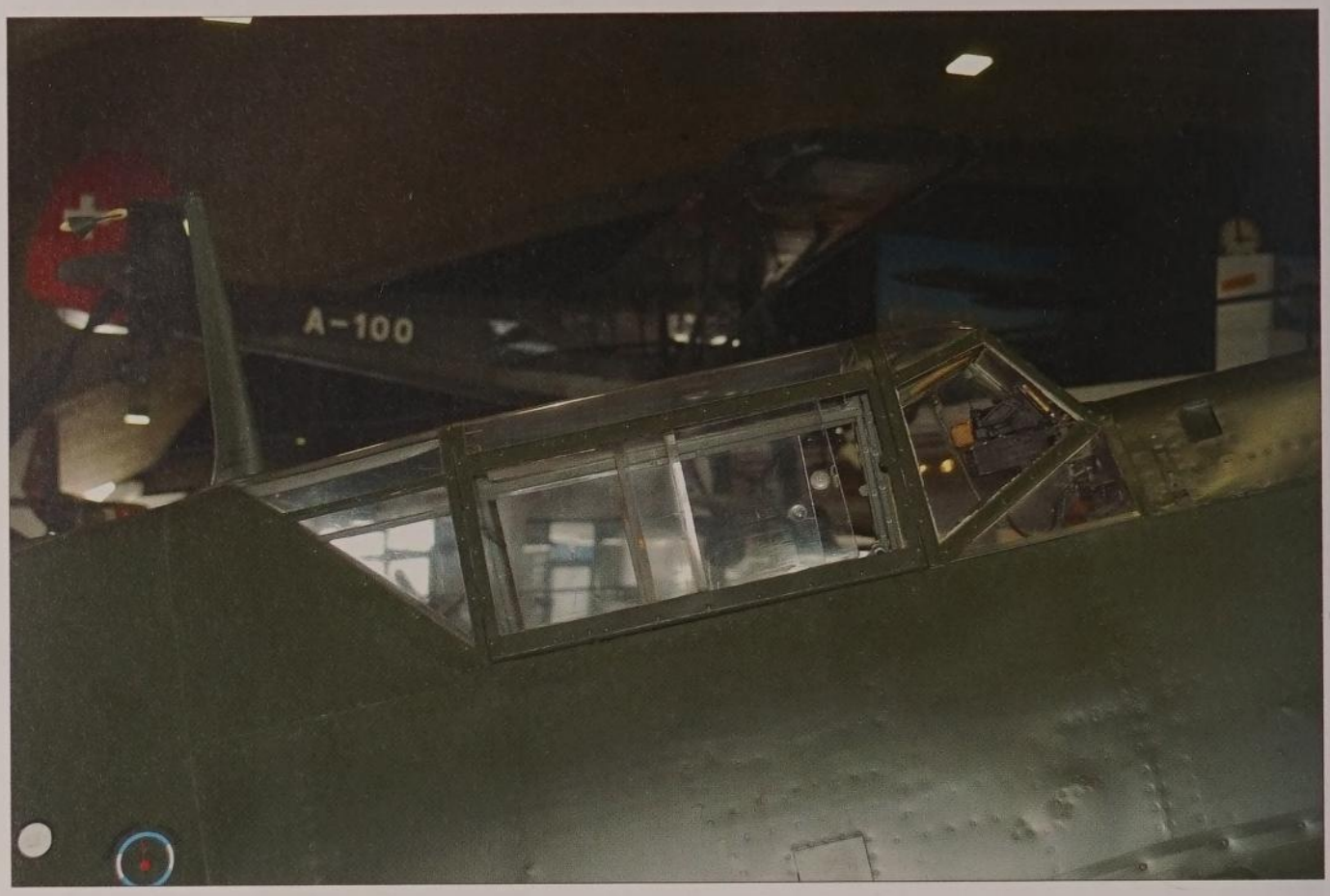
***Left:** Engine air inlet close-up shot on Swiss Bf 109E-3. (David Weiss)*

***Below, left:** Air screw hub details. Note also propeller manufacturer's – VDM logo.*

Below, right: Coolant filler access panel. (David Weiss)

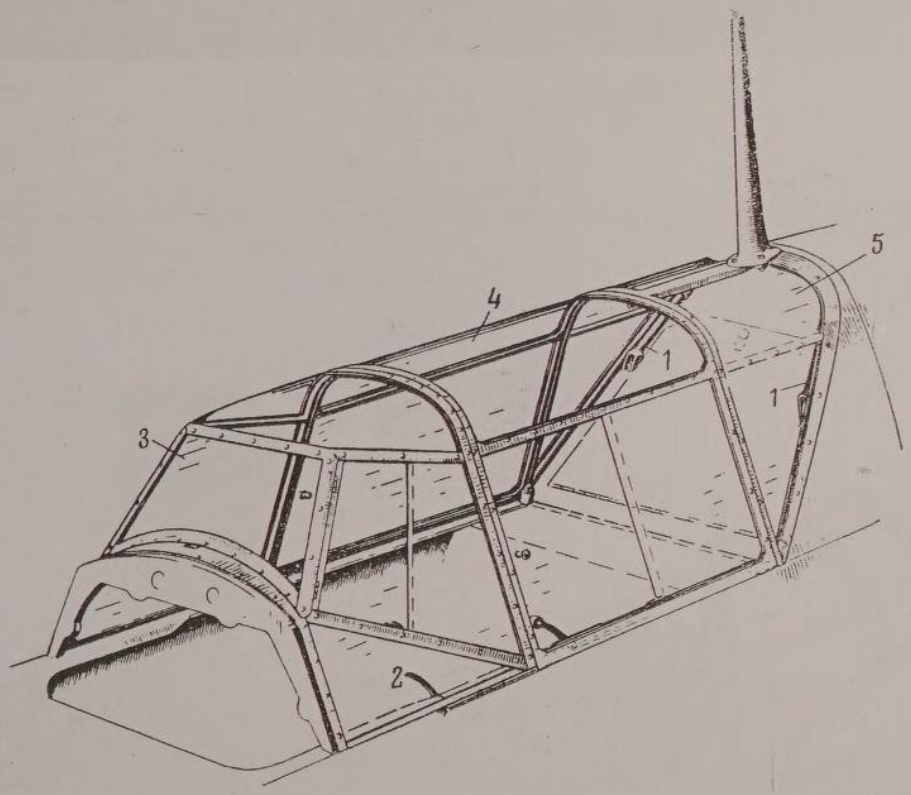


Canopy



Two photos of the early style canopy on Swiss Bf 109E-3a. (both David Weiss)

Wartime photo of the Bf 109E-3 with early style canopy.

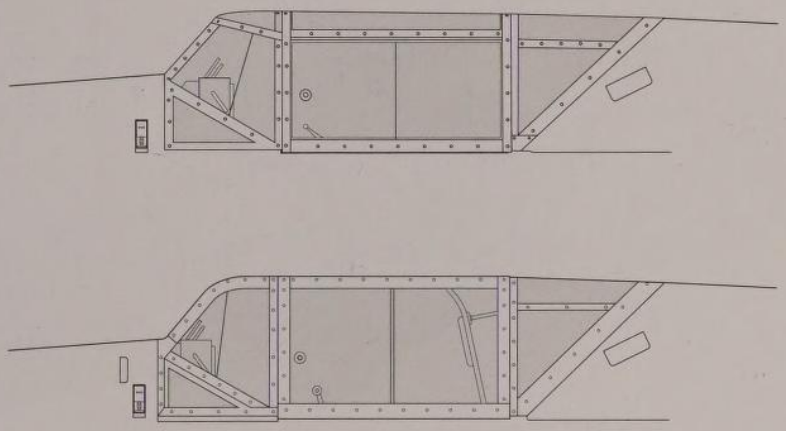


Early style canopy details. Drawing from Russian Technical Manual.

Early style canopy with addition armour glass and rear armour plate. Note side window in fully open position.

Two photos of the early style canopy with additional rear armour. Note how the canopy was secured in the open position.

Late style canopy without additional rear armour plate. It is not known if it was removed at the museum or elsewhere. (Fotios Rouch)



Early and late style canopy comparison.

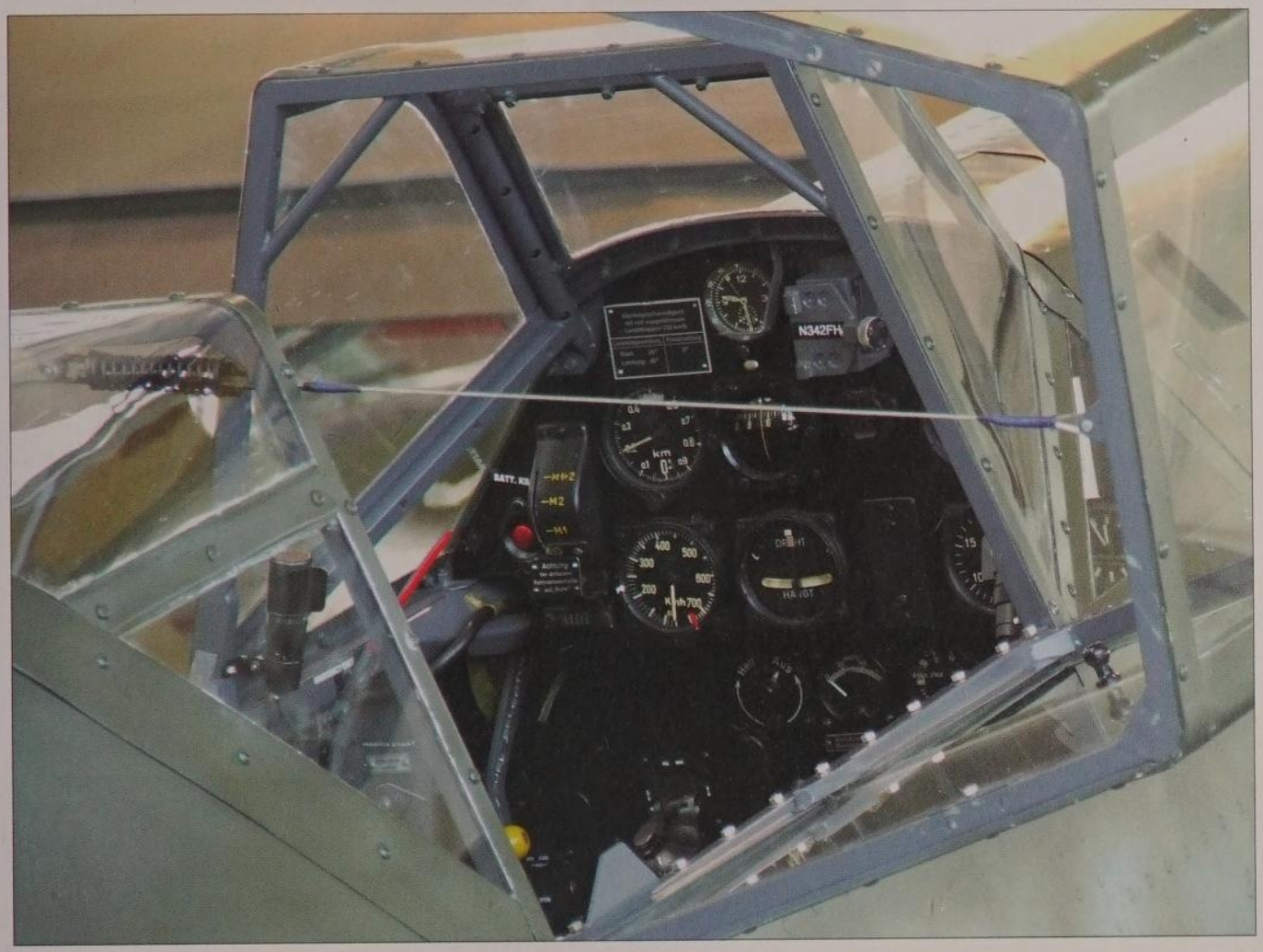
Hauptmann *Franz Xaver Baron Von Werra in the cockpit of his Bf 109E-4. Late style canopy without rear armour plate.*

Rear view of the late style canopy, without rear armour plate. (Fotios Rouch)

Port side of the late style canopy. No additional rear armour plate is installed.

Late style canopy with additional front armoured glass mounted on a Slovak Bf 109E. Stot. Ondrej Ďumbala was for a long time the commander of the 13.(slow.)/JG 52. (via P. Šumichrast)

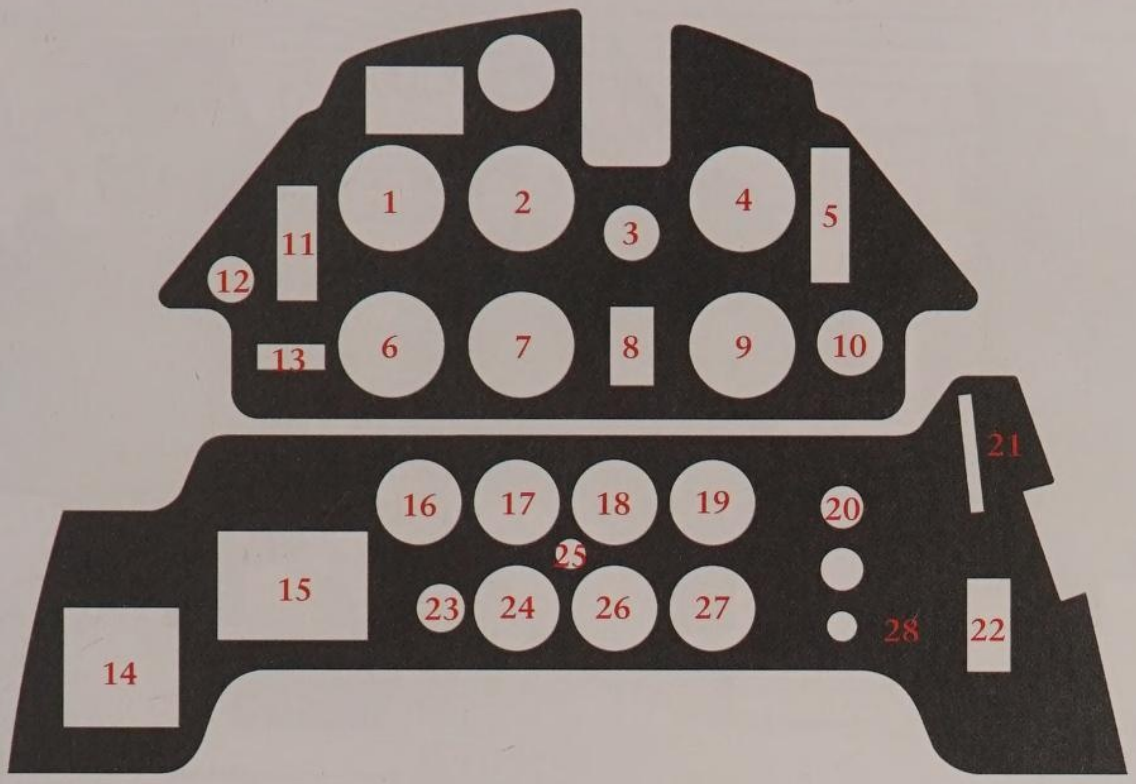
Cockpit



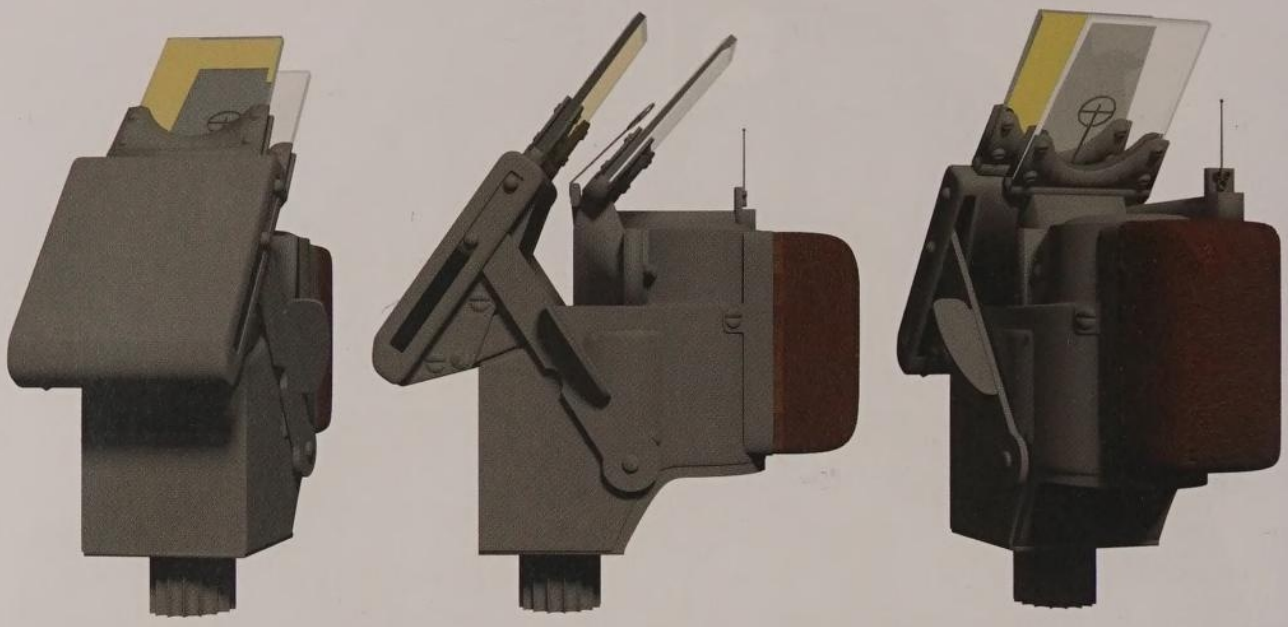
Two photos of the Bf 109E-3 instrument panels. (Both James Kightly)

Bf 109E-7/B instrument panels. Drawing by Dariusz Karans

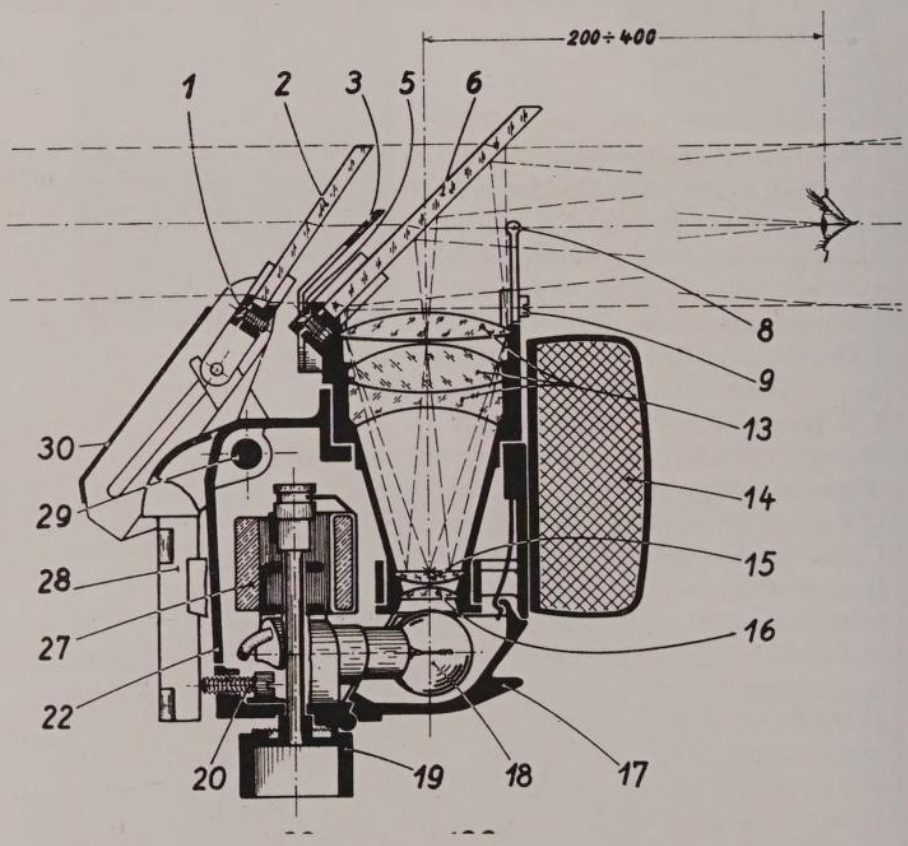
Wartime photo of the Bf 109E-4 instrument panel.



1. Altimeter (Fein-Gro höhenmesser, Fl 22320);
2. Master compass (Führerkompass, Fl 23211);
3. Receptacle for Revi C/12D (Steckdose für REVI, Fl 32624);
4. Boost gauge (Ladedruckmesser, Fl 20550);
5. Compass deviation table (Deviationstabelle);
6. Airspeed indicator (Fahrtmesser, Fl 22231);
7. Turn and bank indicator (Wendezeiger, Fl 22402 mit Ventil, Fl 22403);
8. The propeller selection switch is located here in early versions (Verstellschalter für Luftschraube, Fl 18502);
9. Tachometer (Drehzahlmesser, Fl 20222-3);
10. Propeller pitch indicator (Stellungsanzeiger für Luftschraube, Fl 18503-2);
11. Ignition switch for magnetos panel (Zündschalter, Fl 21121-2);
12. Engine starter switch (Netzausschalter, Fl 32315-2);
13. Pitot head heating warning lamp (Gitterschauzeichen für Staurohrheizung, Fl 32525-3);
14. Radio selector panel (Schaltkasten für FT Fl 26858-1);
15. Machine guns rounds indicator (Schalt – und Kontrollkasten SKK 224, Fl 47293);
16. Cockpit lamp dimmer switch (Verdunkler, Fl 32401-2);
17. Blind panel (Blindplatte);
18. Doubled fuel and oil pressure gauge (Doppeldruckmesser, Fl 20512-2);
19. Undercarriage position indicator (Fahrwerksanzeige – Vierlampengerät, Fl 32526);
20. Undercarriage control lever (Fahrwerksanzeige – Vierlampengerät, Fl 32526);
21. Fuel filter pump control lever (Handpumpenhebel für Kraftstoff-Filterpumpe);
22. Mechanical undercarriage position indicator (Fahrwerksanzeiger mechanisch Nr. 8-109.20-2201);
23. Main switch (Nullschussknopf, Fl 32302);
24. Fuel contents gauge (Vorratsanzeiger für Kraftstoff, Fl 20723);
25. Fuel lack warning lamp (Reststandswarnlampe Fl 32262-1);
26. Oil temperature gauge (Öltemperaturanzeiger Fl 20343);
27. Coolant temperature gauge (Kühlstofftemperaturanzeiger, Fl 20342-2);
28. Undercarriage emergency control lever;
29. Instructions for flap settings, landing speed, etc.;
30. Board clock.



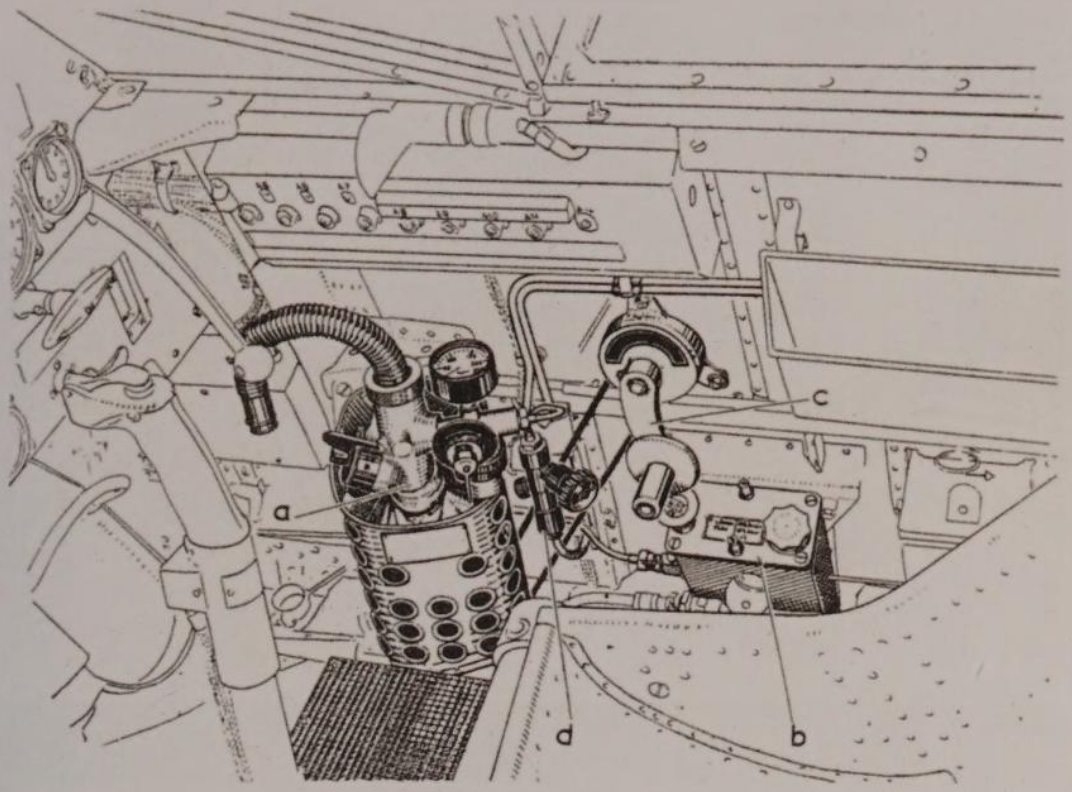
Revi 12D. (3D drawings by Dariusz Grzywacz)



Revi 12D gun sight cross section drawing from Technical Manual.

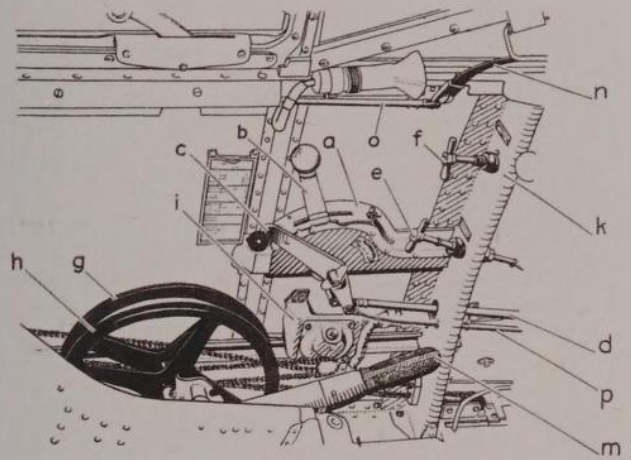
1. Colourised glass mounting screw;
2. Colourised glass;
3. Sight;
5. Screen mounting screw;
6. Projector screen;
8. Bow sight;
9. Mounting screw;
13. Projector lens;
14. Pod;
15. 16. Lenses;
17. Body;
18. Lamp;
19. Calibration knob;
20. Locking screw;
22. Body;
27. Lamp control resistance;
28. Mount;
29. Pivot;
30. Colourised glass cover.

Explore interactive Revi 12D 3D drawing here: https://skfb.ly/BDqQ

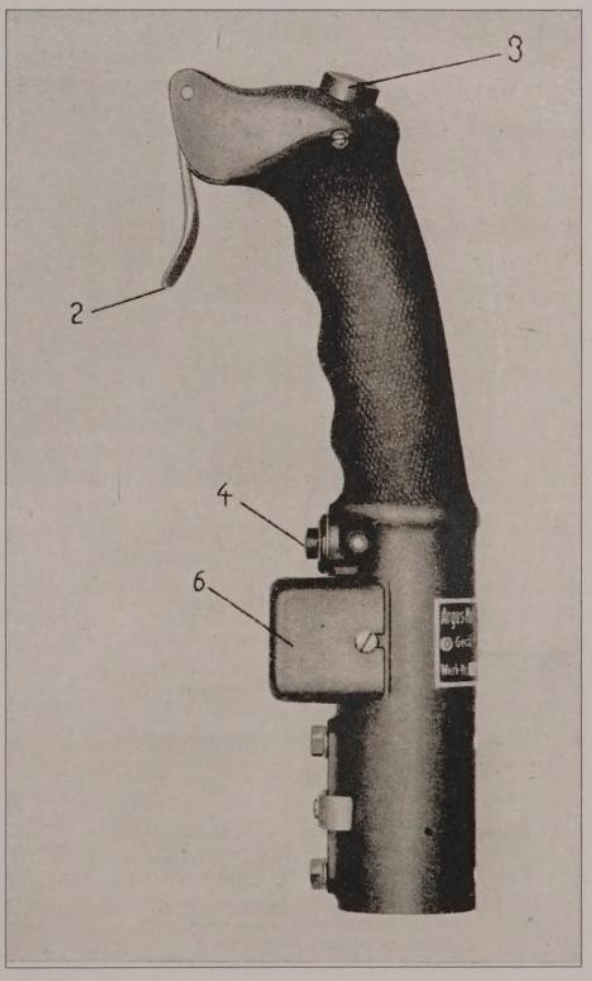


Starboard side of the Bf 109E cockpit.
a. Oxygen apparatus;
b. Fuel primer pump;
c. Coolant radiator flap control;
(Technical Manual)

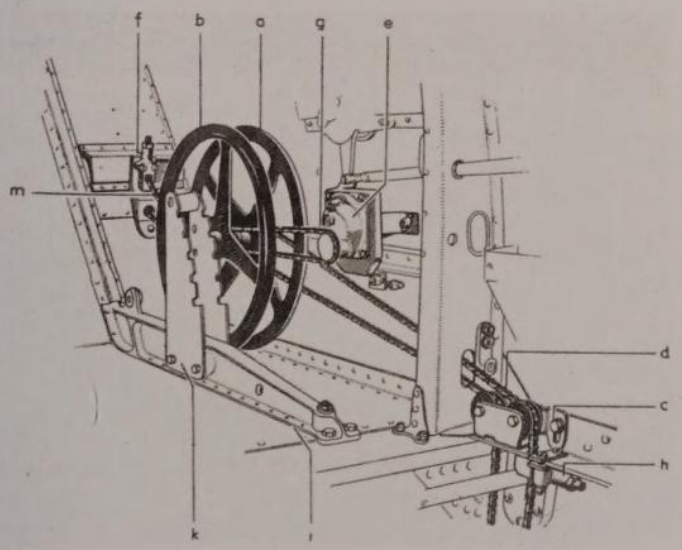
Bottom, right:
KG 12 steering column used on Bf 109E.
(Technical Manual)



Left: *Port side of the Bf 109E cockpit.*
b. Throttle lever
c. Oil cooler flap control
g. Flaps hand wheel control
h. Tailplane adjustment hand wheel



Below: *Details of the flaps (c) and tailplane wheels (b). (Technical Manual)*



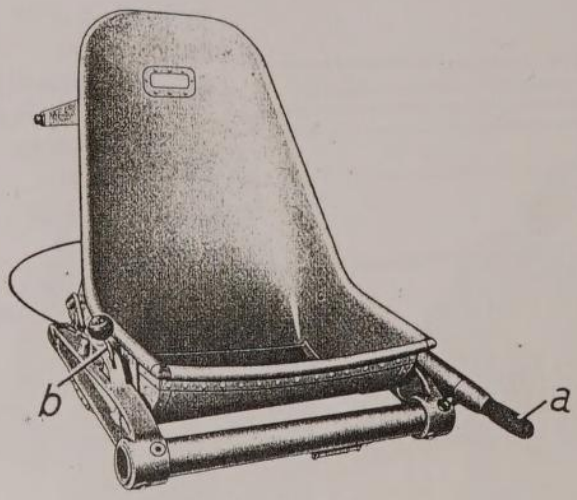
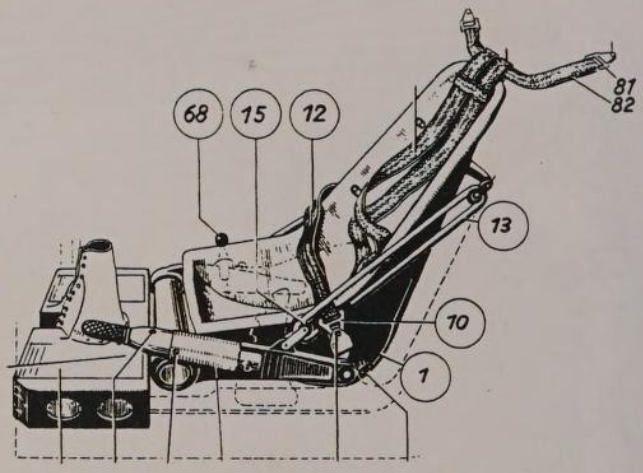
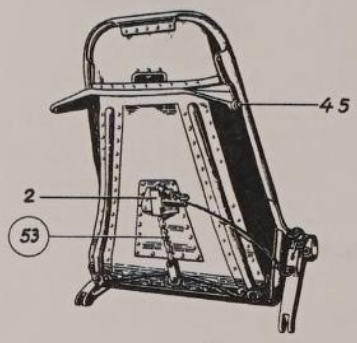


Abb. 4: Führersitz

a = Handgriff für Sitzverstellung b = Hebel für Rückengurtverstellung





Above: Three drawings of the pilot's seat. (Technical Manual)

Right: Bf 109E-4/B cockpit. Aircraft preserved in Hendon.

Below, left: Control column details. (Technical Manual)
Below, right: Lower, right part of the Bf 109E-7 instrument panel. (Technical Manual).

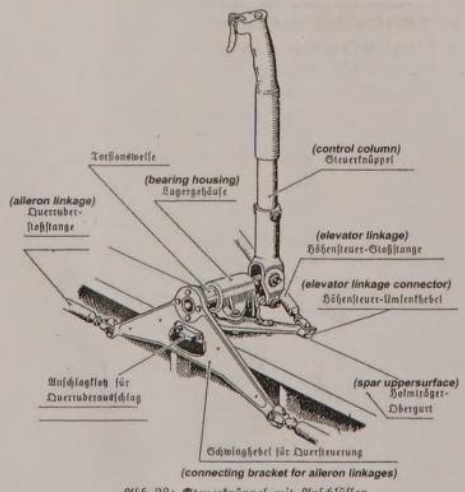
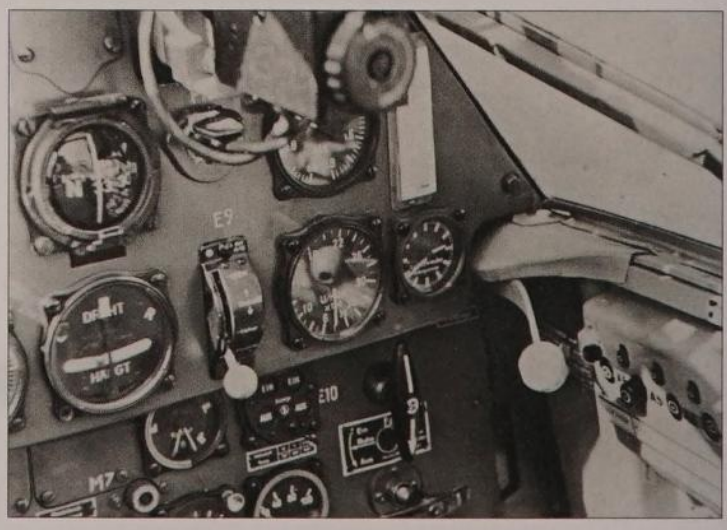
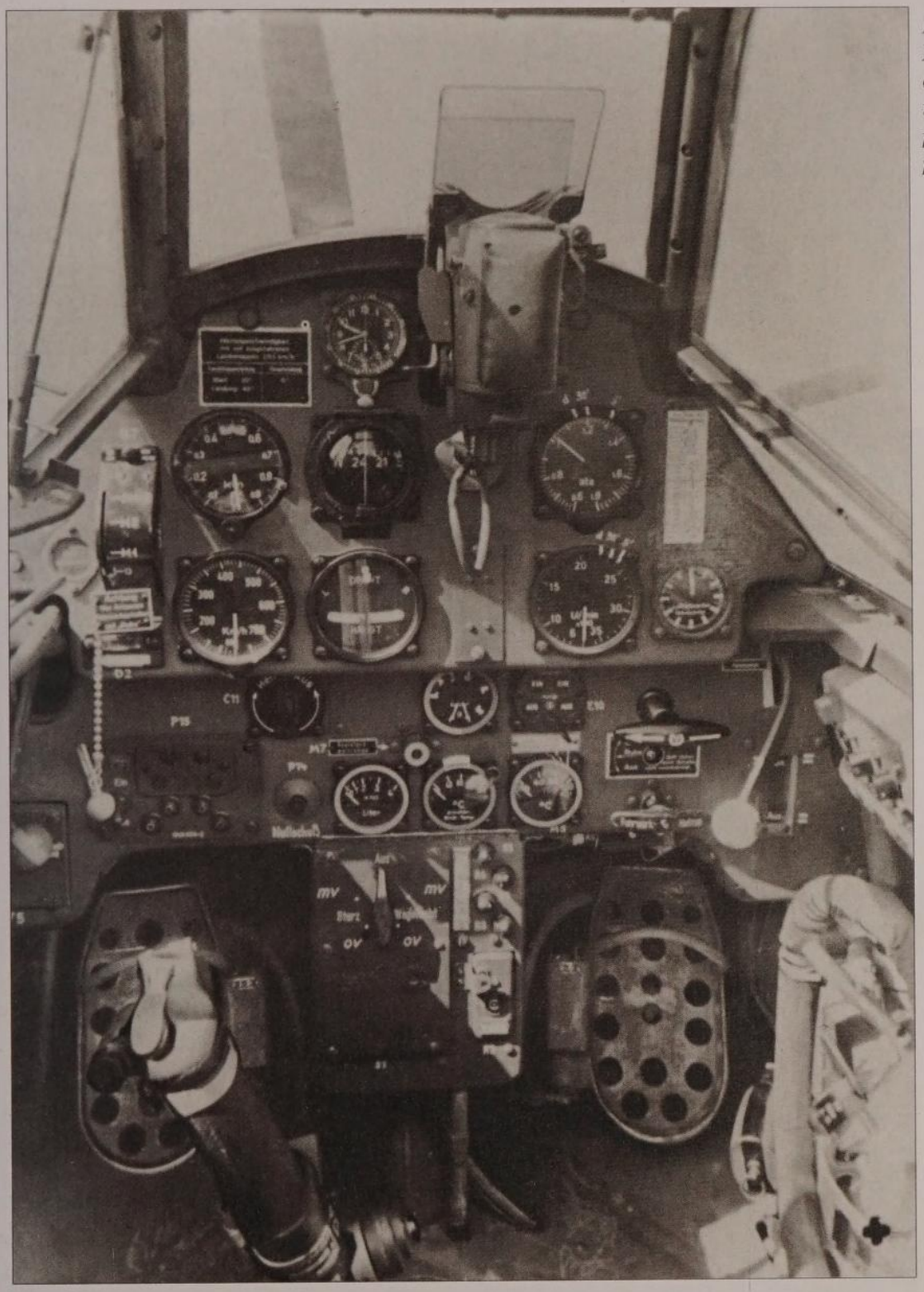
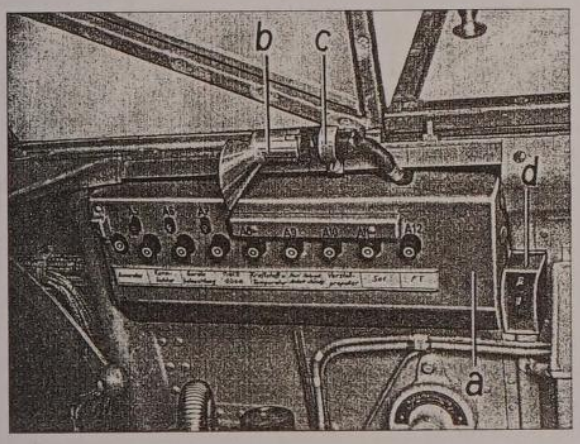


Abb. 28: Steuerknüppel mit Anschlüssen





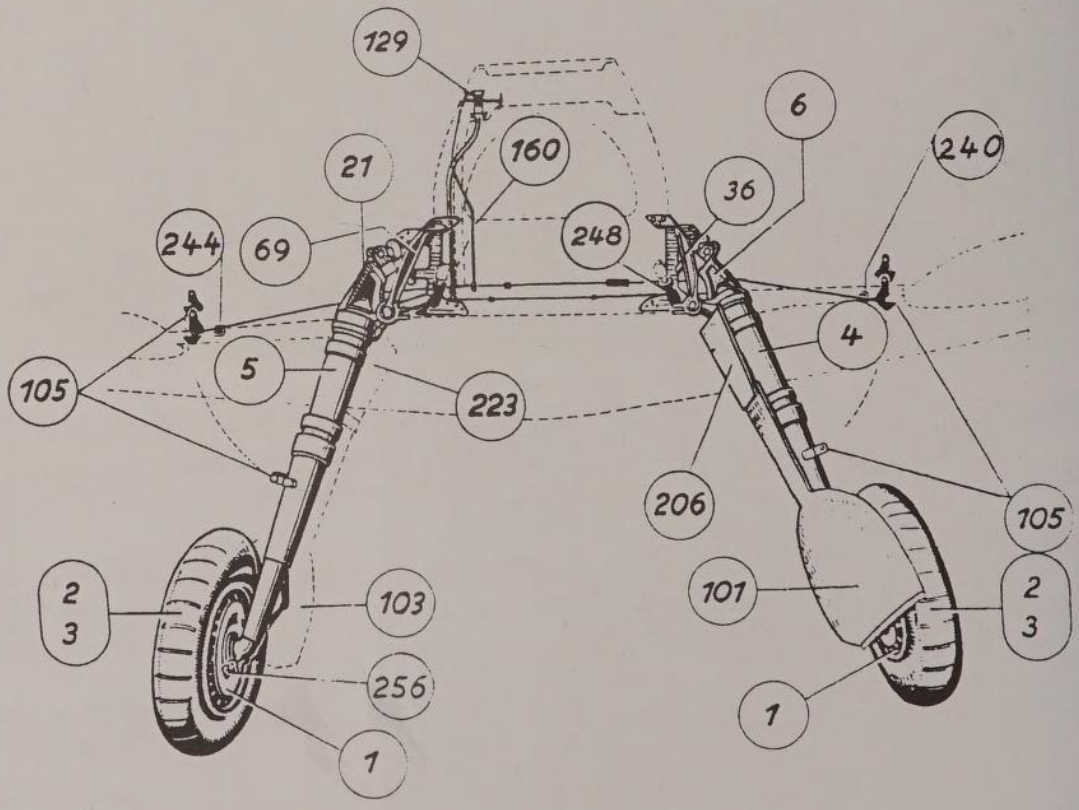
Bf 109E-7/B cockpit. Note different version of the rudder pedals the ones shown in the picture on the previous page.



Main electrical circuit breaker panel, located on the starboard side of the cockpit. (Both Technical Manual)

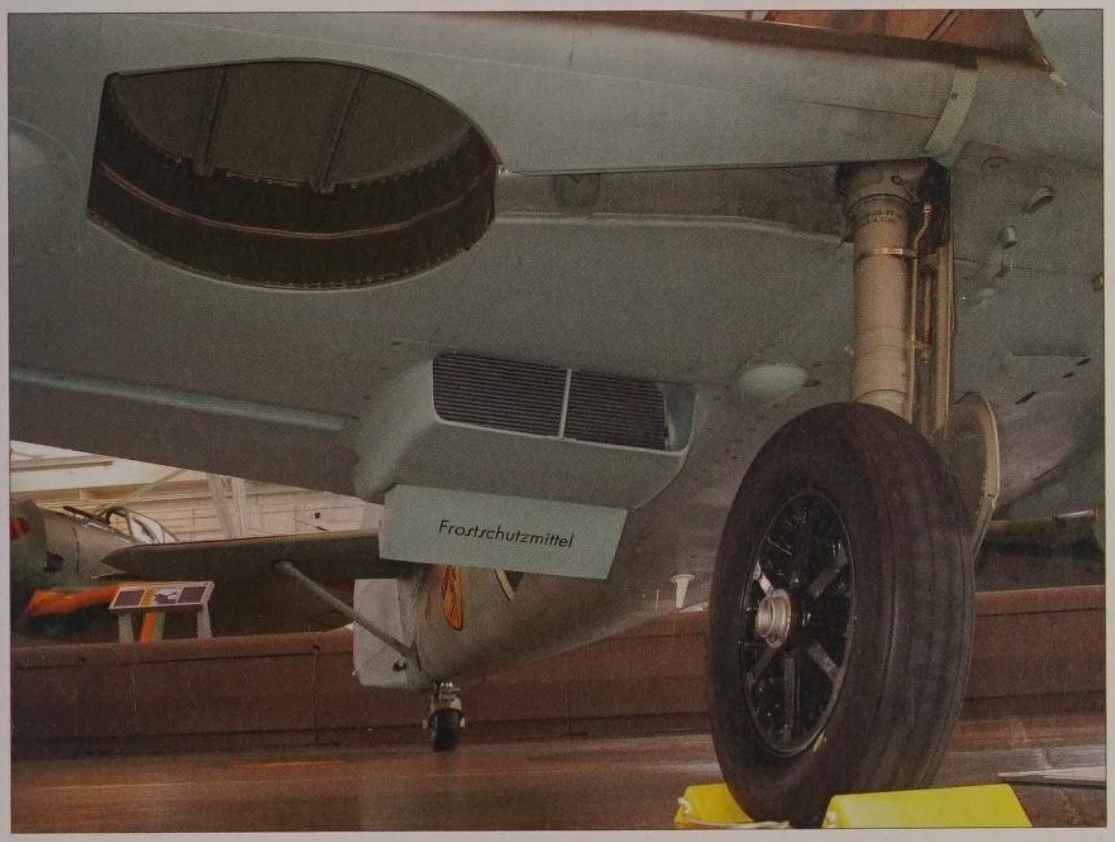
Undercarriage

Main undercarriage, front view. (James Kightly)

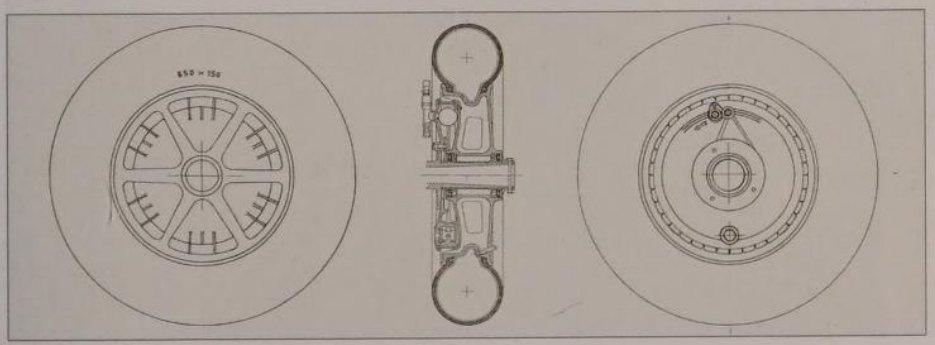


Main undercarriage arrangement. (Spare Parts Manual)

Starboard main undercarriage leg and wheel. (Fotios Rouch)



Starboard main undercarriage leg and wheel. Main wheel well is also clearly visible. (Fotios Rouch)



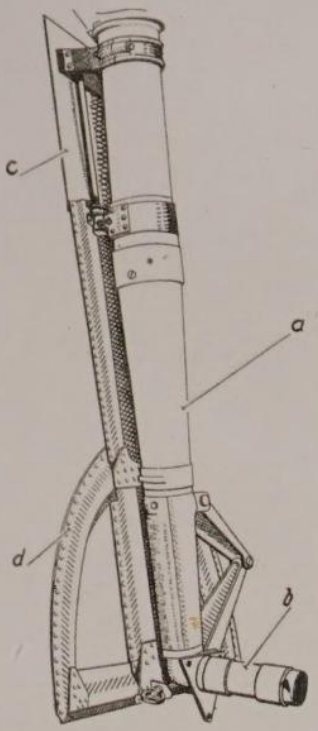
Main wheel technical drawing. (Technical Manual)

Above: Outer side of the main lego covers. Note that it is not one cover but two separate ones. (Bartłomiej Belcarz)

Above: Inner view of the main leg. Brake hydraulic pipe is visible.

Below: Front view of the main leg. (Bartłomiej Belcarz)

Below: Main wheel details. Construction of the hub is well shown. All German wheel hubs were painted in glossy black.



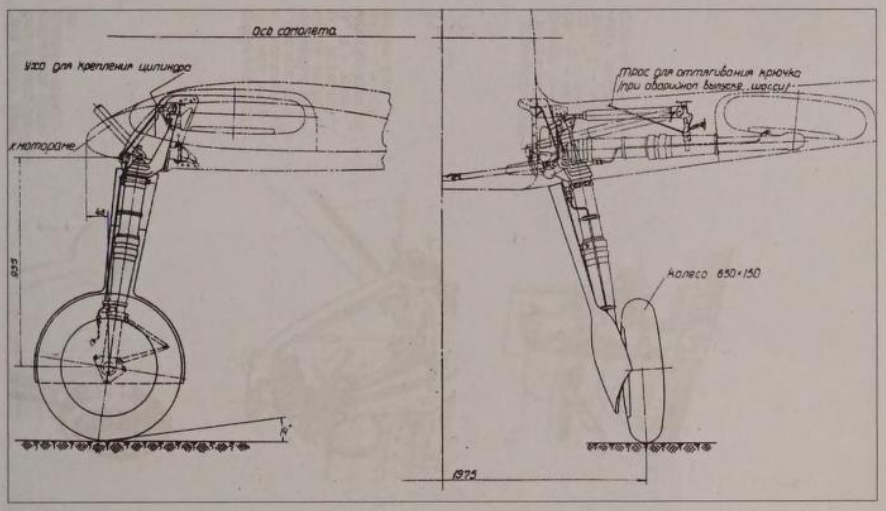
Above: *Main leg and cover. (Technical Manual)*

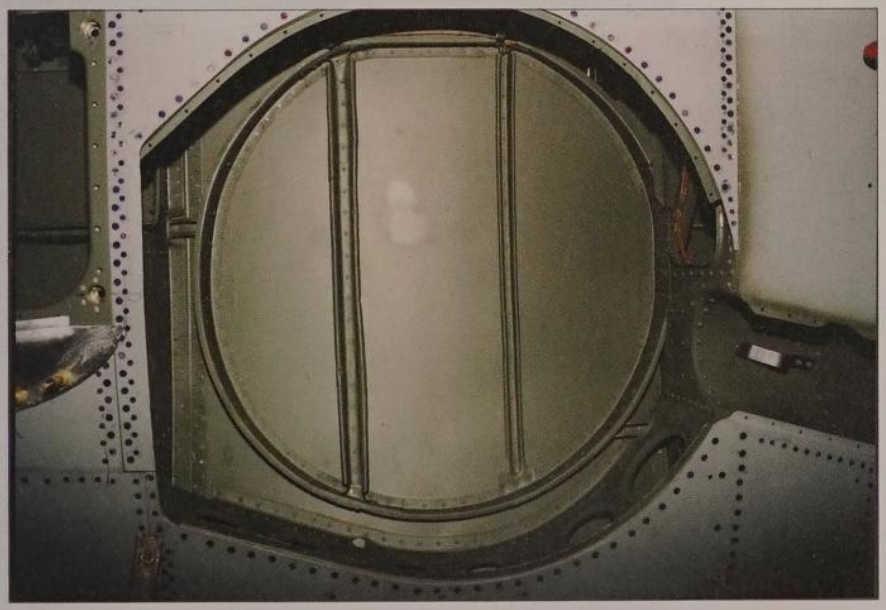
Above. left: Main wheel, hub details.

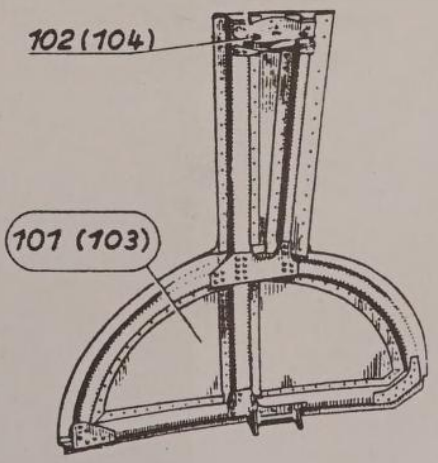
Left: Russian drawing of the main undercarriage, main dimensions are also shown. (Russian Technical Manual)

Below, left: Main wheel well during restoration. (Bartłomiej Belcarz)

Below, right: Main leg cover, inner side. (Spare Parts manual)







Above: *Main wheel well with liner attached. Swiss Bf 109E-3. (David Weiss)*

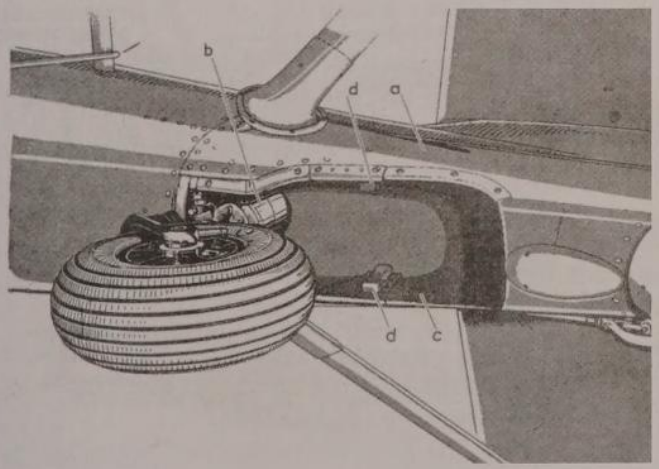
Right: *Similar view of the Bf1 109 E preserved in Munich. (James Kightly)*

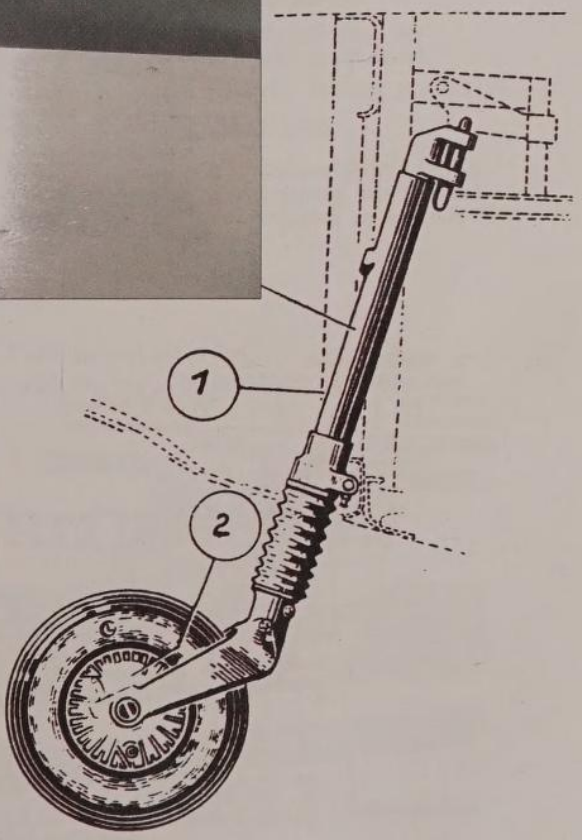
This Bf 109E turned-over probably during landing exposed its undercarriage.

Two photos of the tail wheel, starboard and port side. Note that wheel bay is covered which was not common.
(Both James Kightly)

Bottom, left: *Underside view of the tail wheel.*

Bottom, right: *Tail wheel arrangement drawing.*
(Both Technical Manual)





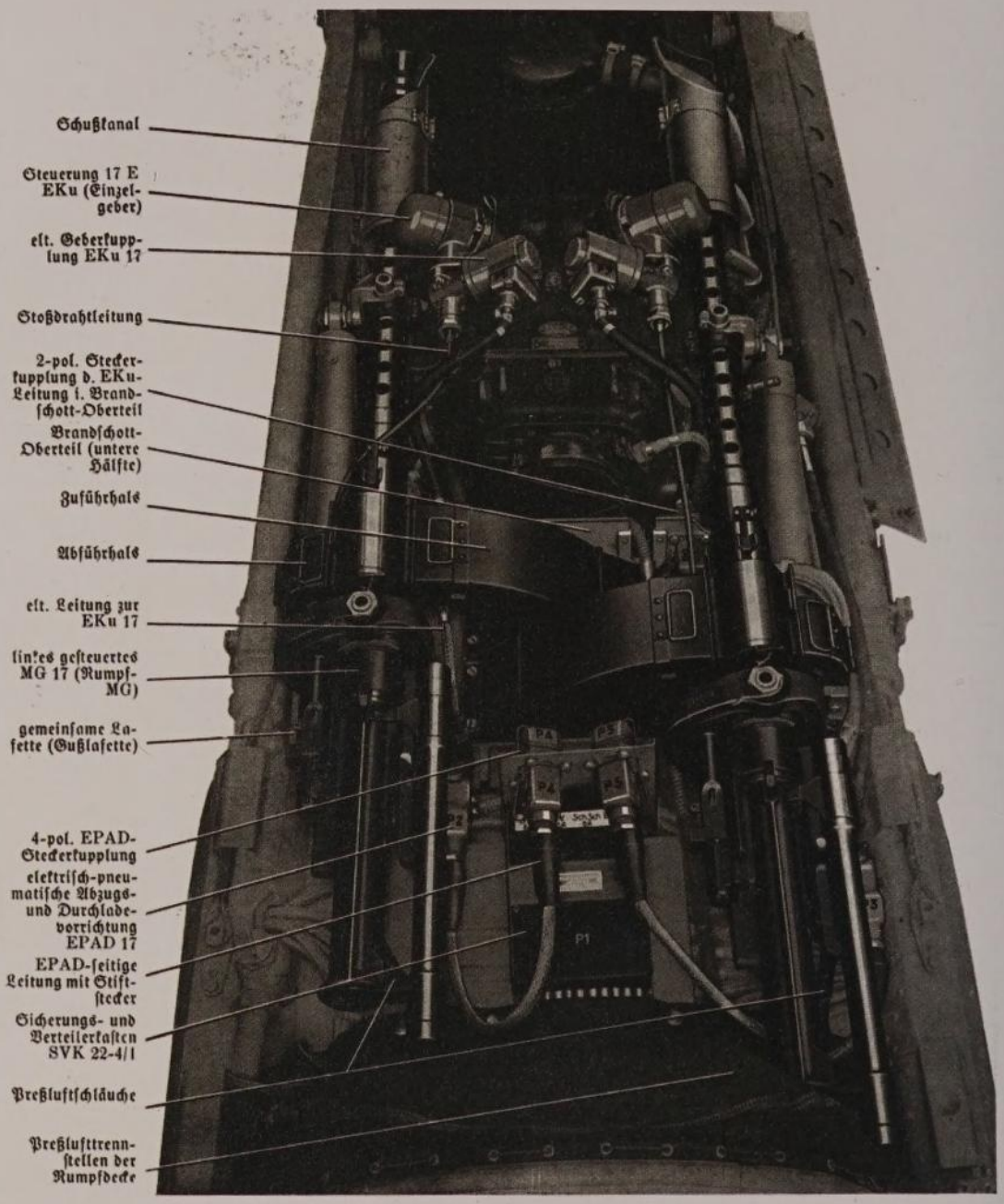
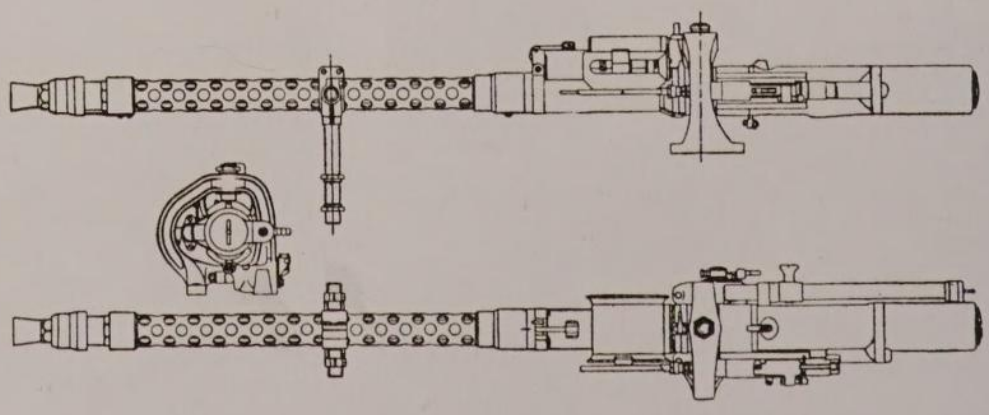
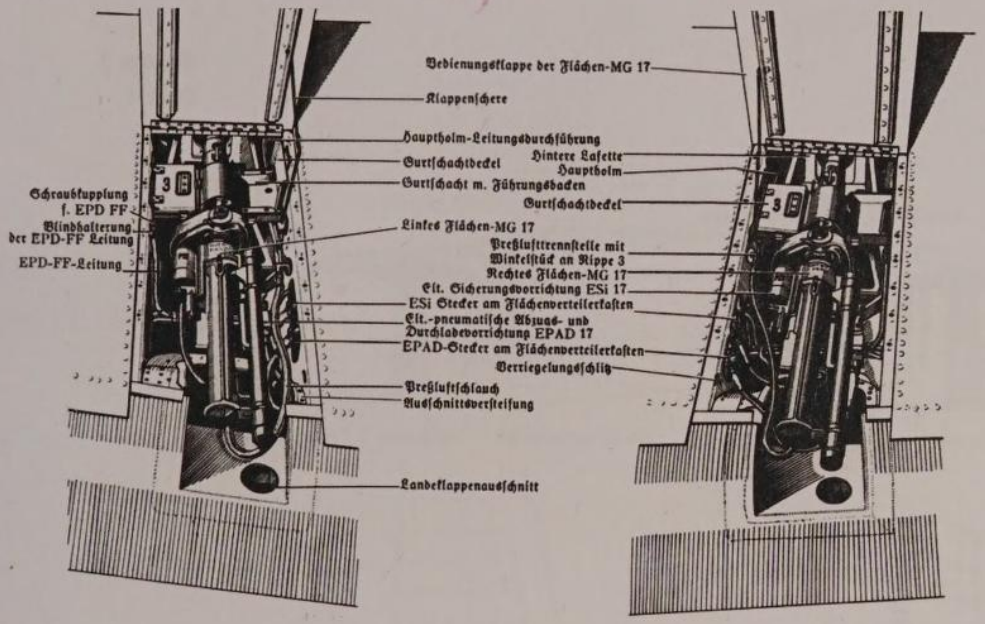


Abb. 7: Einbau der Rumpf-MG 17

Photo of the fuselage MG 17 machine guns mounted in the Bf 109E. (Technical Manual)
MG 17 machine gun drawing from Technical Manual.

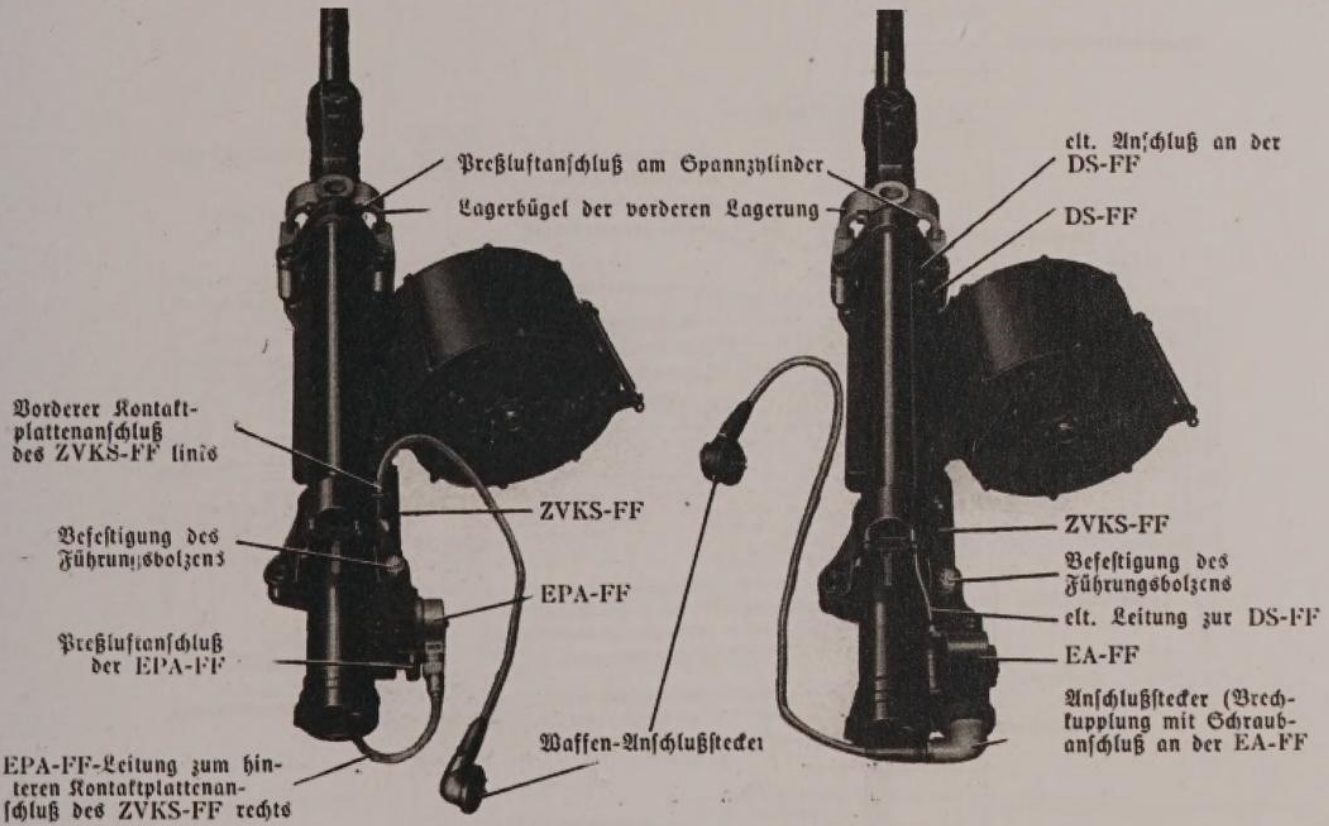


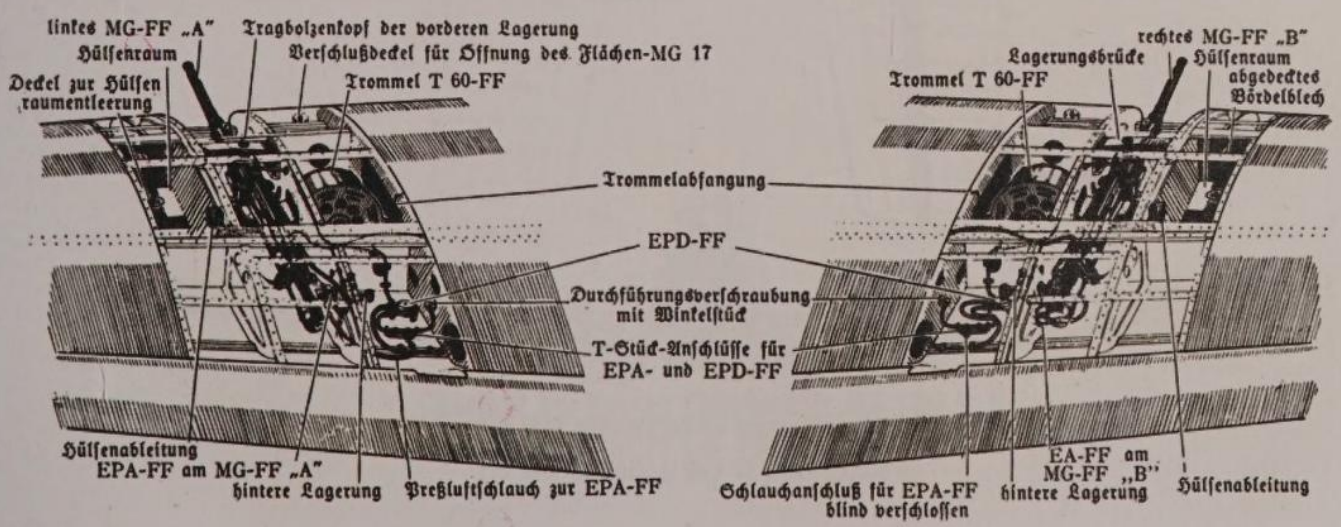


MG 17 machine guns mounted in the Bf 109E-1 wings. (Technical Manual)

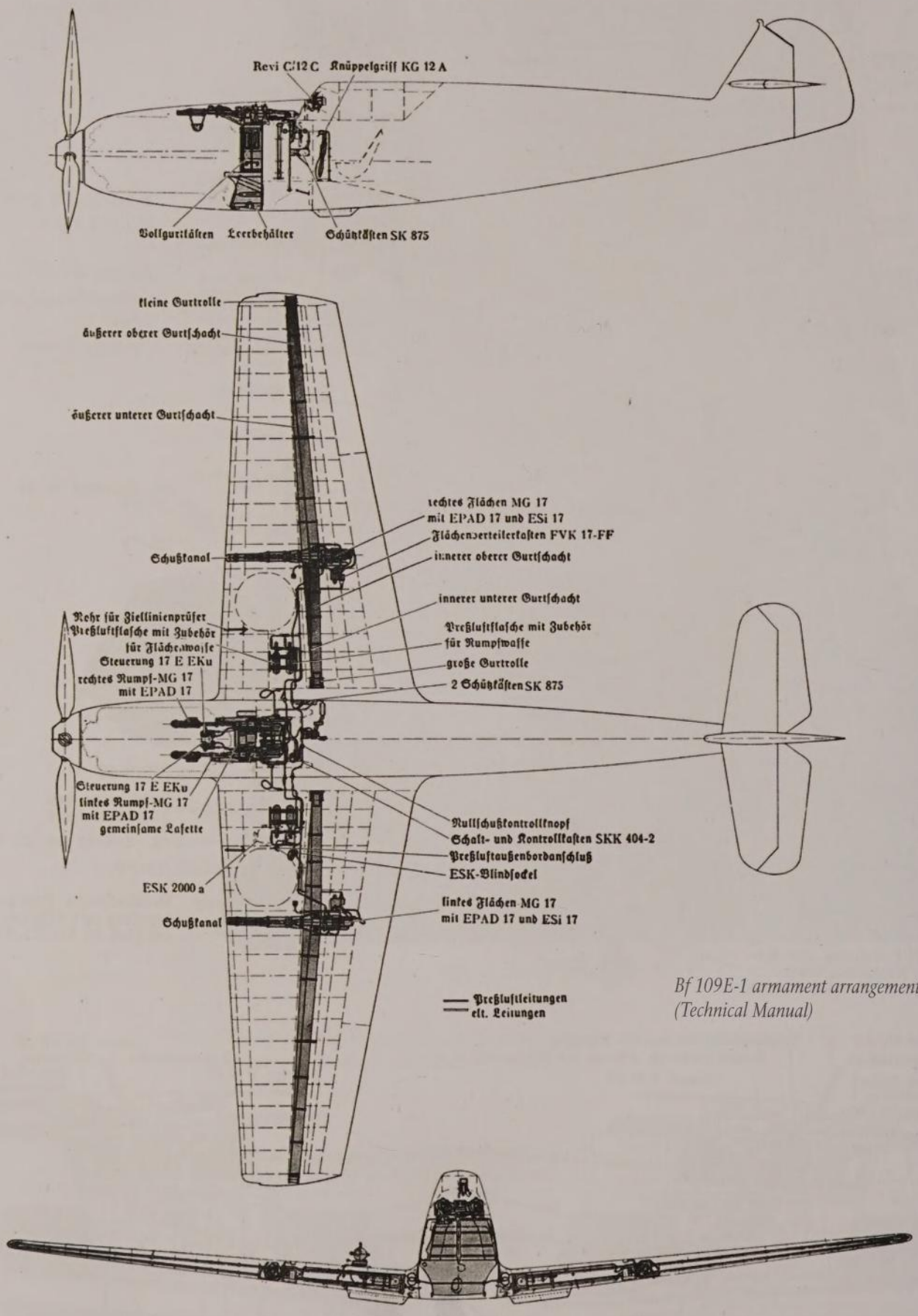
Below: Details of the MG-FF cannon.

Bottom: MG-FF cannon mounted in the wings. (Technical Manual)





Anlage 1
Blatt 1

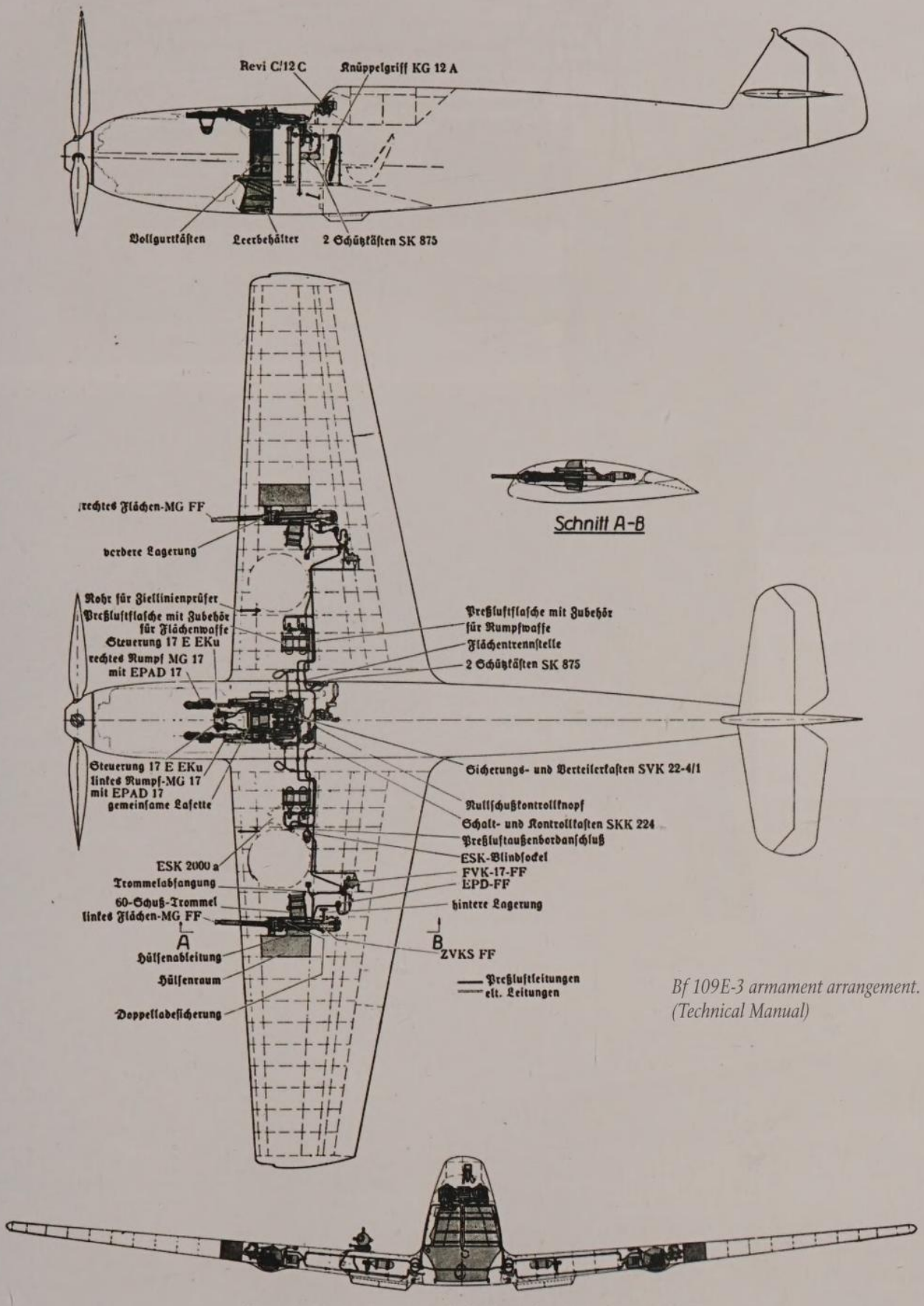


Bf 109E-1 armament arrangement.
(Technical Manual)

Übersicht der starren Schußwaffe BF 109 E 1

(2 Rumpf-MG 17 und 2 Flächen-MG 17)

Anlage 1
Blatt 2

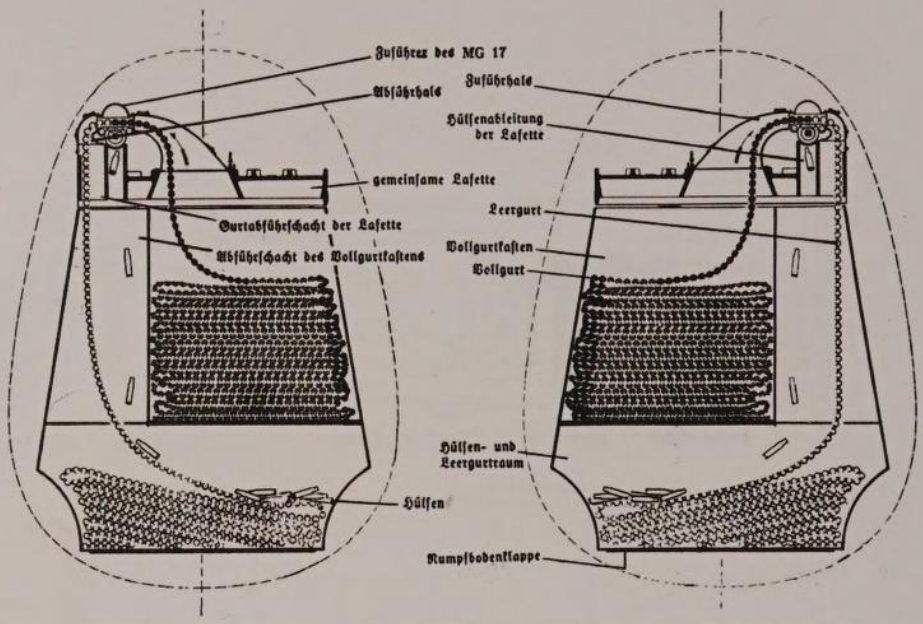


Bf 109E-3 armament arrangement. (Technical Manual)

Übersicht der starren Schußwaffe BF 109 E 3

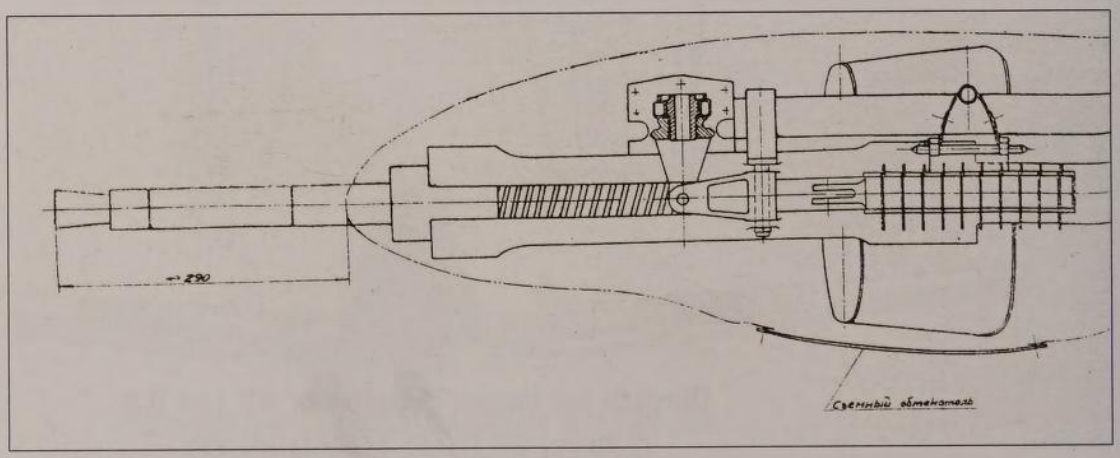
(2 Rumpf-MG 17 und 2 Flächen-MG-FF)

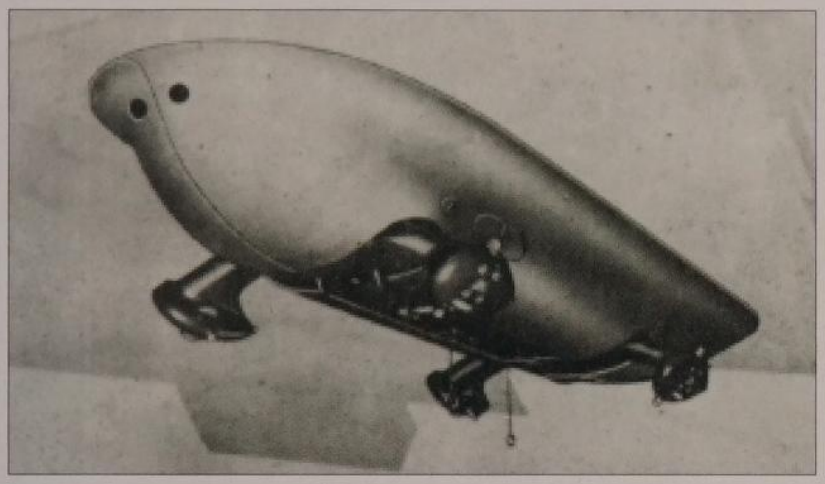
MG 17 machine guns ammunition feeds. (Technical Manual)

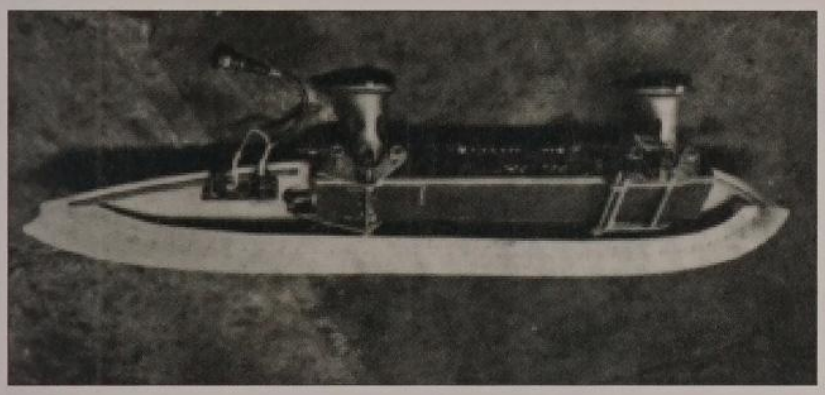


Bf 109E-3 wing with MG FF cannon mounted.

Russian drawing of the MG FF cannon mounted in the Bf 109E-3 wing. (Russian Technical Manual)



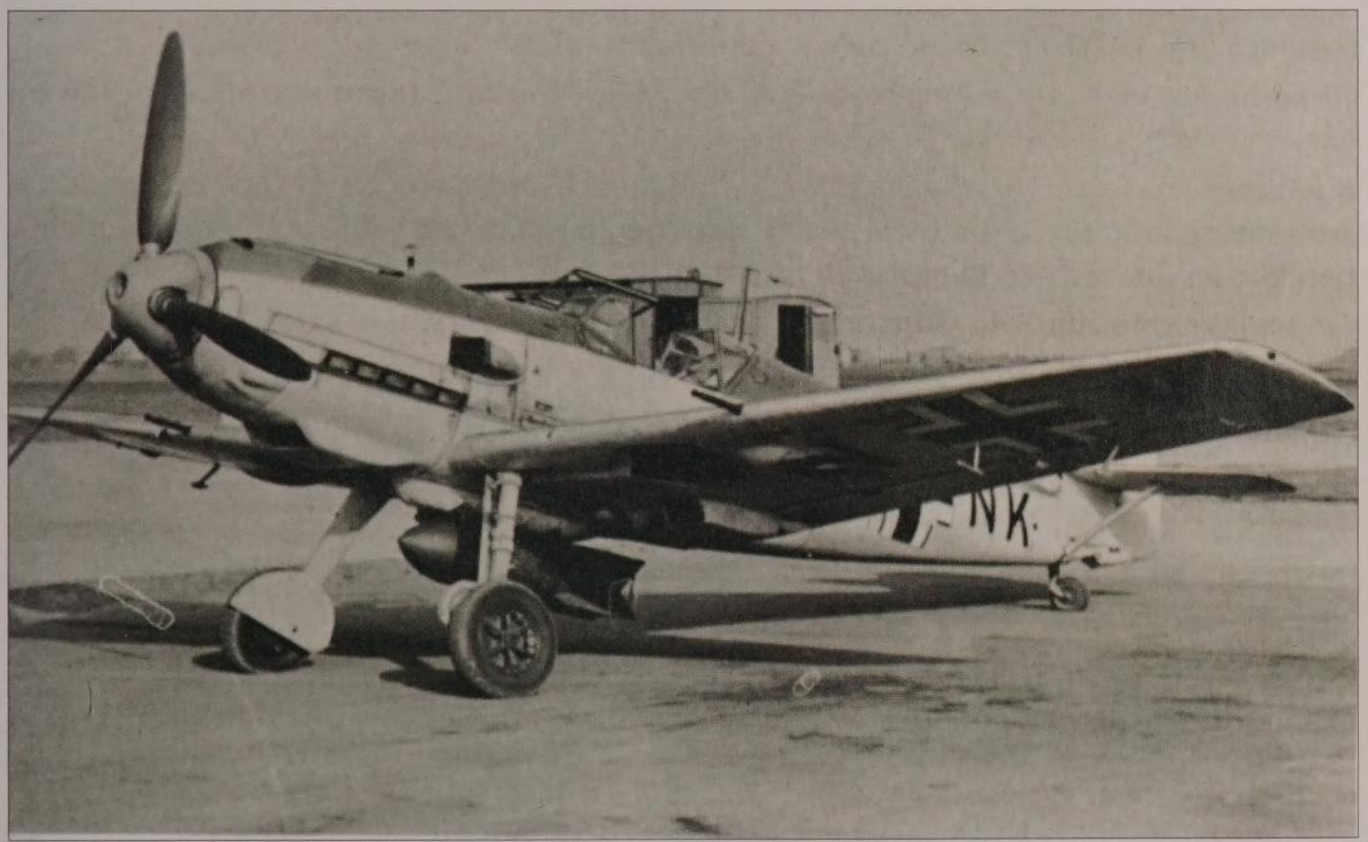




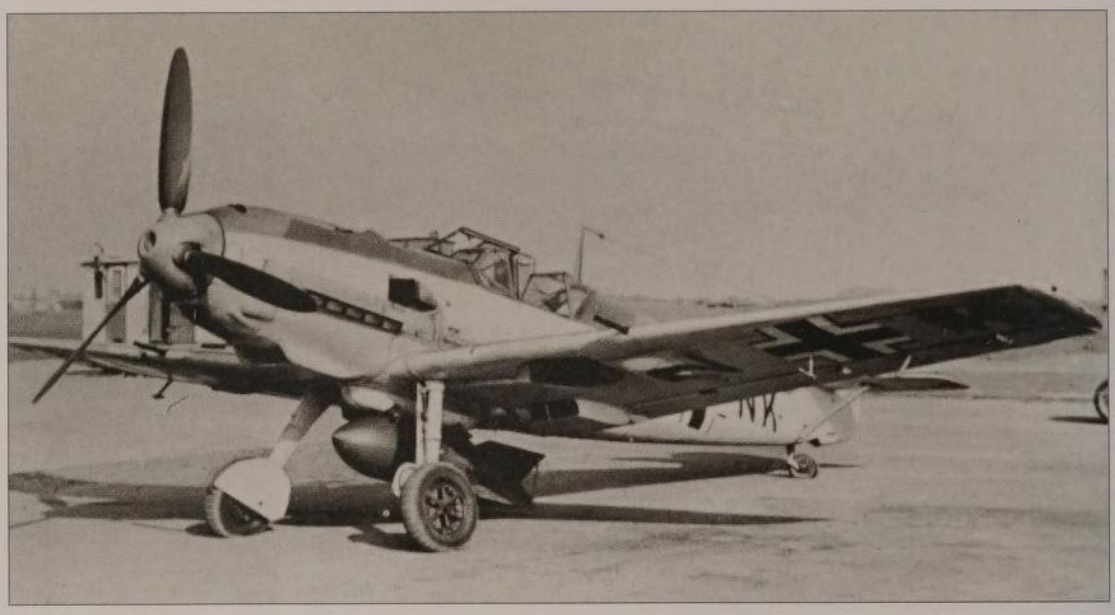
Above: *Bf 109E-3/B with ETC 500 bomb carrier.*

Above, left and left: *ETC 500 bomb carrier. (Technical Manual)*

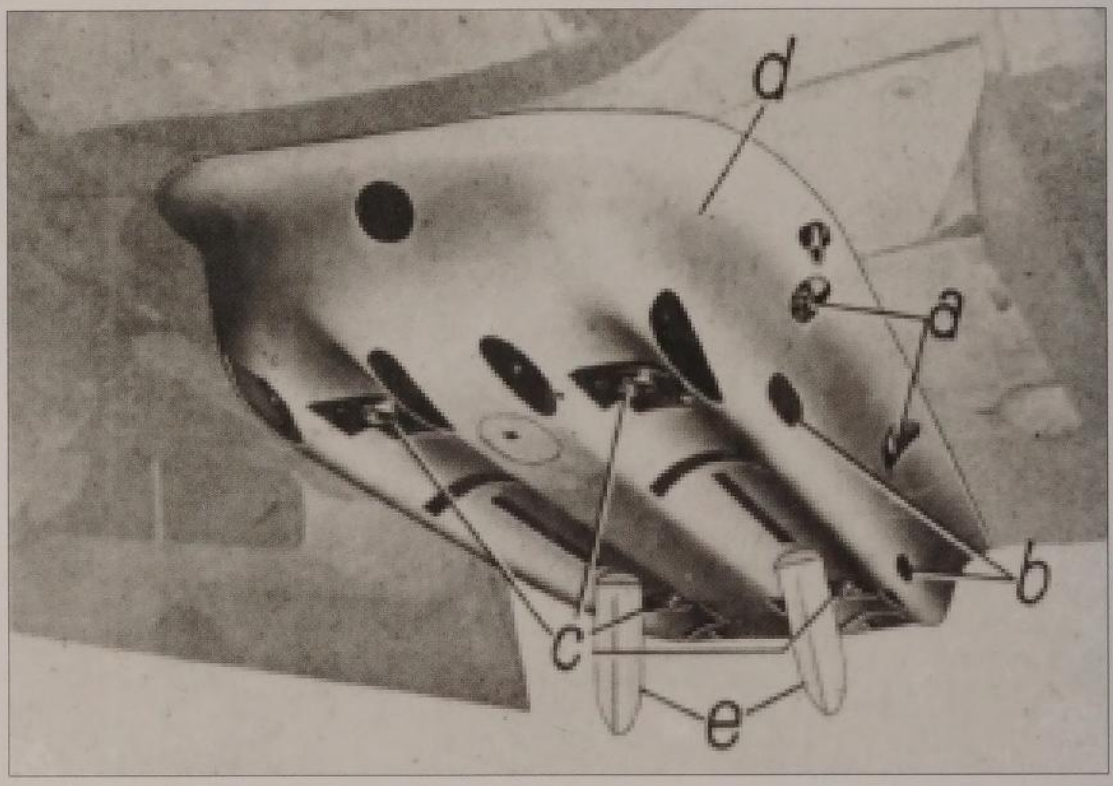
Bf 109E-4 during tests with ETC 500 bomb rack and SC 250 bomb.

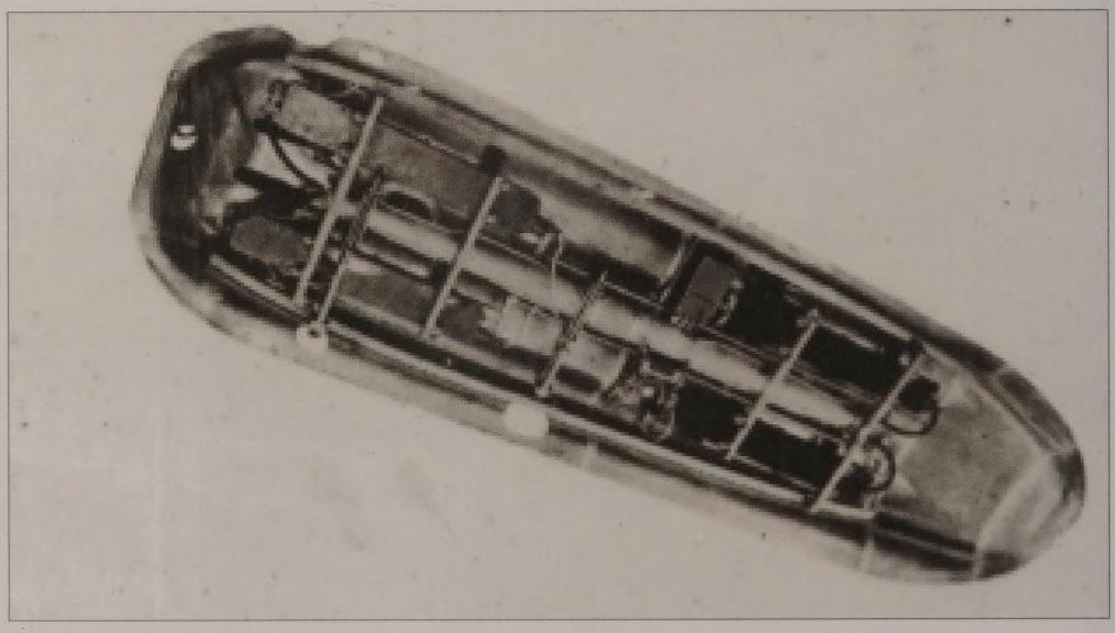


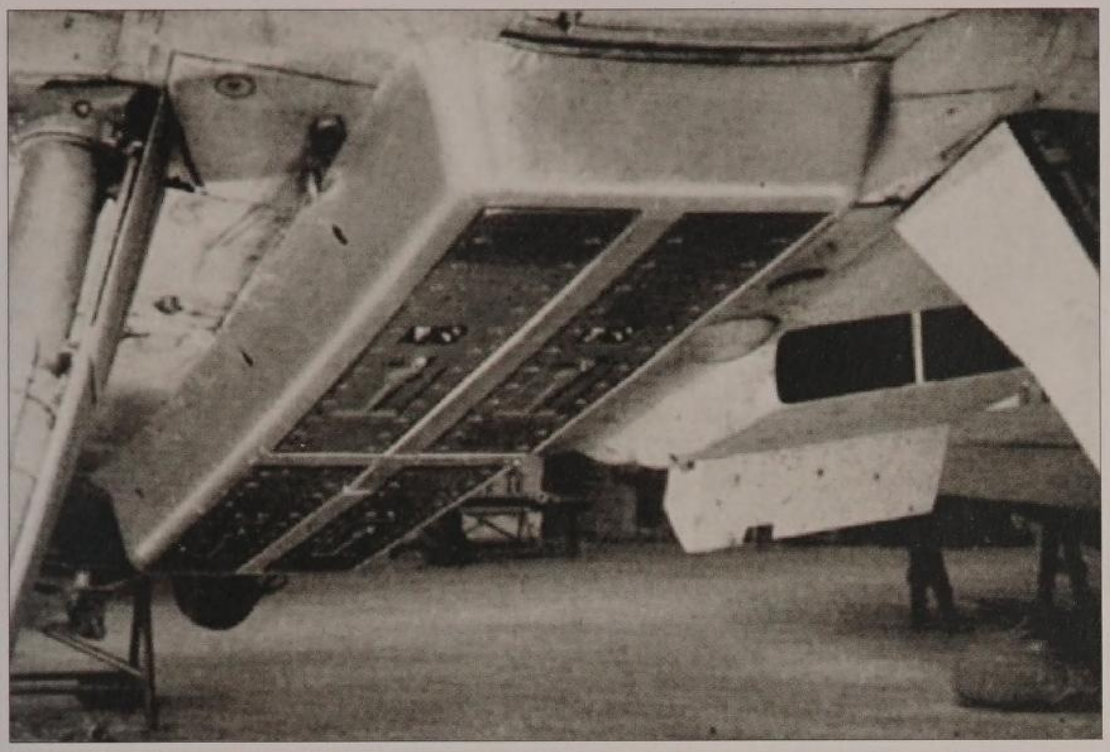
Bf 109E-4 during tests with ETC 500 bomb rack and SC 500 bomb.



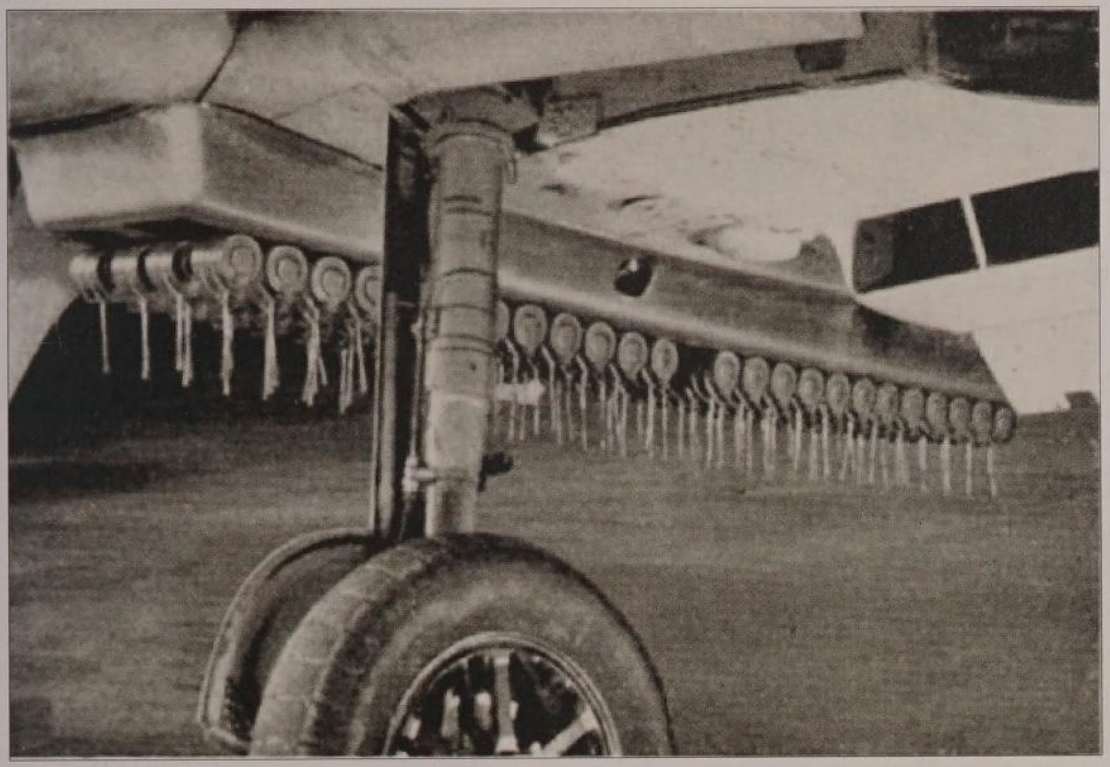
Two photos of the ETC 50 VIII for 4 SC 50 kg bombs. (Technical Manual)







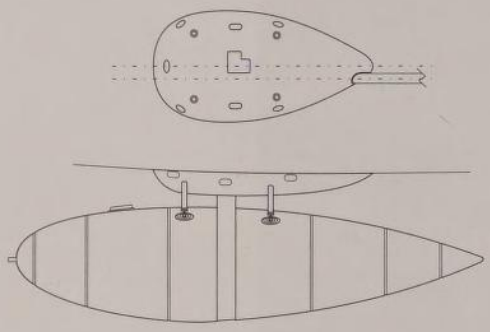
Two photos of the SD2 anti-personal bomb carrier. (Technical Manual)

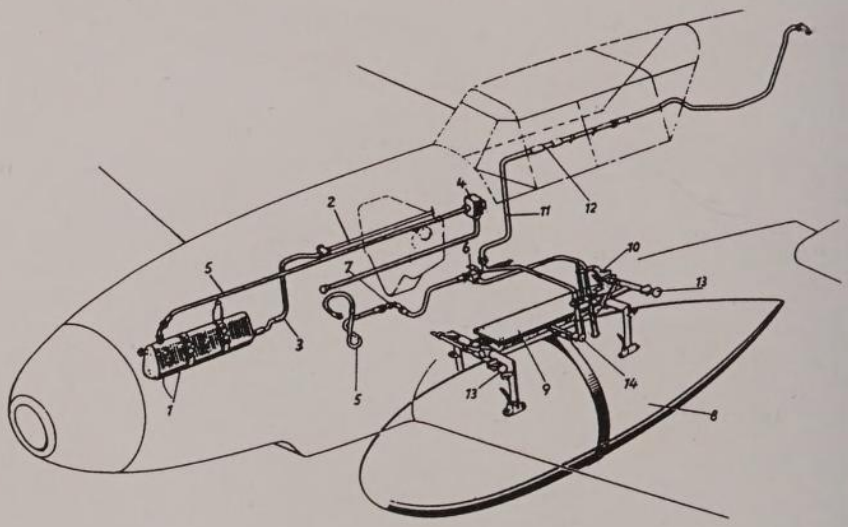


***Bottom:** Two photos of the SD2 bombs. (Technical Manual)*

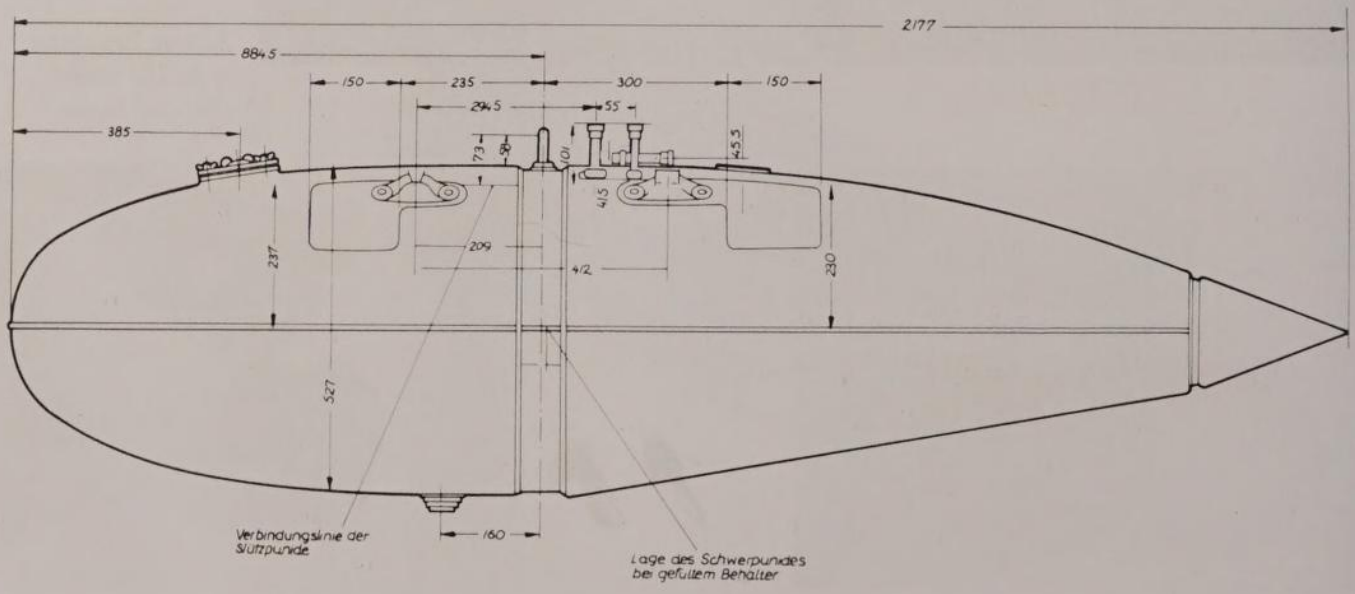
Bf 109E-7 with auxiliary fuel tank attached. This 300 litres tank was made of aluminium. Empty weight about 6.9 kg. It was widely used by Luftwaffe *from 1940 till the end of the war.*

300 l fuel tank and the carrier. 1/48 scale.





***Right**: Additional fuel tank installation on Bf 109E-7.*
***Below**: Auxiliary standard* Luftwaffe *300 litres fuel tank's dimensions. (Both Technical Manual)*



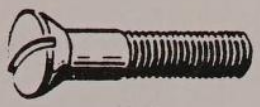
Standard parts

Sechskantschraube
M6=KrK 131,
M8 u. M10=DIN 931

Hexagon bolt

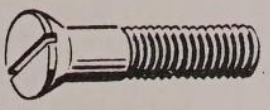
Linsenschraube DIN 85

Lock bolt



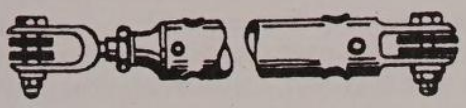
Linsensenkschraube DIN 91

Lock bolt



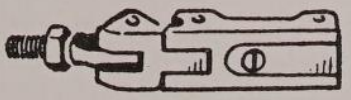
Senkschraube DIN 63

Countersunk screw



Stoßstange BfN 127

Bumper



Hebelverschluß BfN 16401

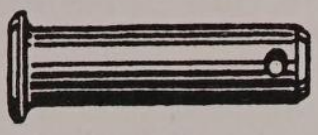
Lever lock

Handlochdeckel
BfN 16618

Hand hole cap

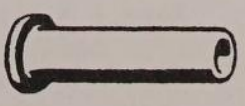
Hebelverschluß BfN 16402

Lever lock



Bolzen DIN 1434

Bolt

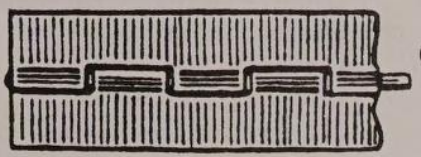


Nietbolzen BfN 107

Rivet

Schnallriemen HgN 15307

Buckle



Gelenkband
DIN L72

Joint hinge

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